CIO

THE MAGAZINE FOR INFORMATION EX

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HOW DO YOU MEASURE UP?

Special Section On Executive Compensation And Evaluation

Inacom Corp.'s
Jeff Hartigan

AN INTERNATIONAL DATA GROUP PUBLICATION

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best grOW a whole lot ***FASTER*** and *richer.* Who knows how

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CIO

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The standards by which CIOs are judged are rapidly shifting—and getting tougher.

By Christopher Koch

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Full Market Value

The highest-paid IS executives have the word "chief" in their titles, work for large companies and are willing to move, according to *CIO*'s first executive compensation survey. Perhaps not surprisingly, gender and age are still factors.

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I think I can... **48**

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A matter of privacy **56**

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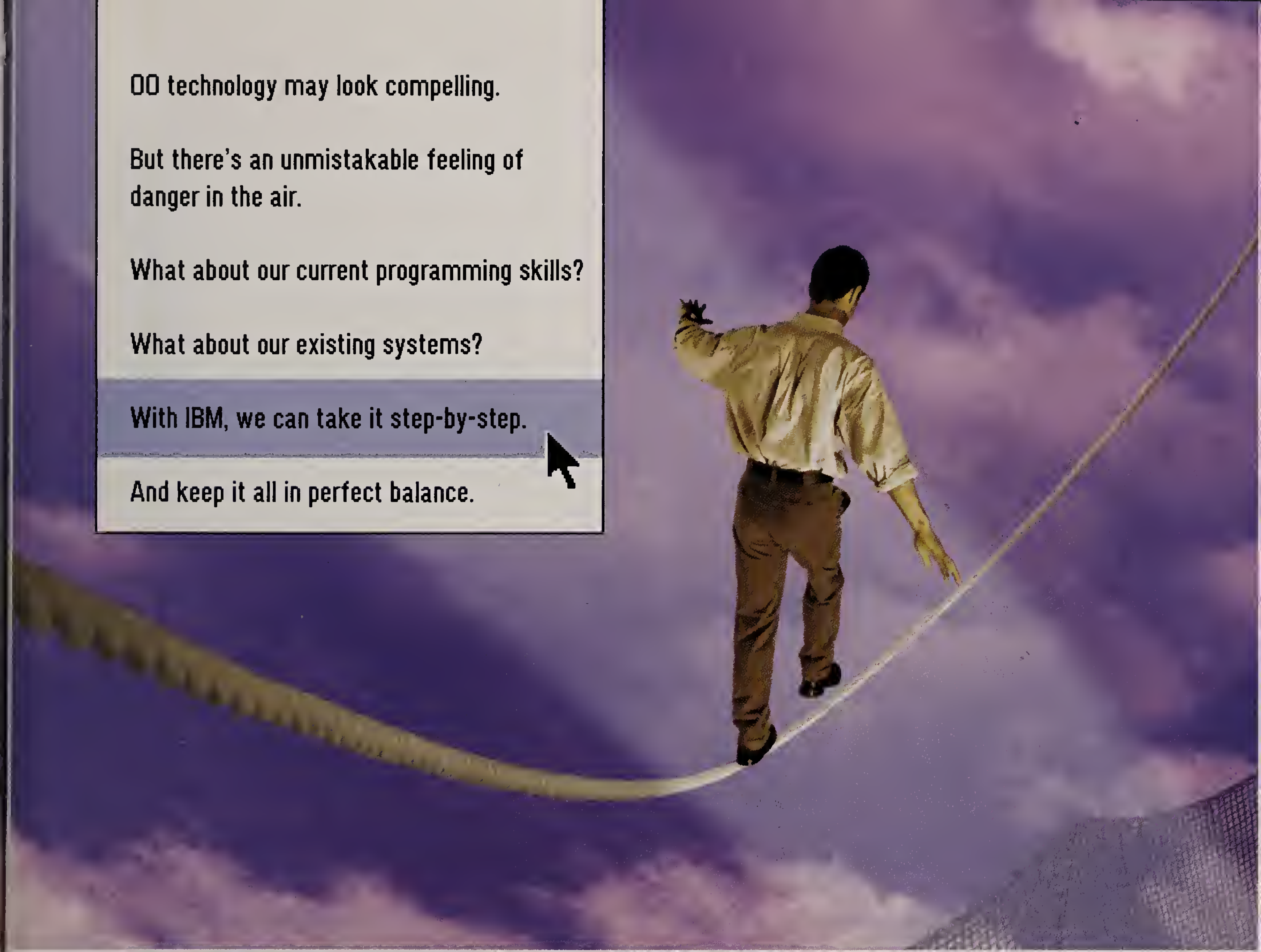

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LETTER FROM THE EDITOR

$146,900.

There you have it—the average annual compensation for CIOs in 1995. But that's not all you'll find in *CIO*'s salary survey of more than 1,000 readers, which begins on Page 28.

You'll also get detailed information on salaries for IS professionals broken out by job title, experience, IS staff size, IS budget size, company size, industry group, geographic region, age and gender. Using this information, you'll be able to compare your organization's compensation schedule with the average of other organizations.

All of this valuable information was gathered by Senior Editor E.B. Baatz, a former research economist, who led the three-month research effort, pored over the reams of data and wrote the analysis.

Most managers use salary surveys to help decide whether a particular worker is adequately compensated in relation to other workers. But the actual value of any position in an enterprise cannot be determined from survey information alone, given the variables of supply and demand, corporate culture, and individual skills and expertise. In the end, individual worth must still be gauged and compensation paid on the contribution a worker makes to the organization.

So it is with a CIO's compensation. Like other workers, a CIO is paid for performance, but the measure of a CIO's contribution is hard to peg. For one thing, many organizations are engaged in multiyear migrations to new computer architectures. IT organizational models, previously hierarchical and host-centric, are increasingly horizontal and service-oriented. In this fast-changing environment, CIOs' compensation will partly depend on how quickly they adapt to and champion the new world of decentralized computing.

In addition, three-quarters of CIOs describe themselves as career IS professionals, which means they have followed a technical career path. That's certainly a plus, but it won't be enough. Success in the new techno-business environment (and a fatter paycheck) will require CIOs to marry their strong technical expertise with business aptitude and interpersonal skills.

The combination of business/technical traits will prove indispensable in companies with business- and customer-driven IT strategies. Our survey results bear it out: CIOs who believe their most important job is to leverage IT to business advantage earned a significant salary premium over the average IS executive. You can bank on it.

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CIO

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> *"A feast is made for laughter, and wine maketh merry: But money answerth all things."*
> *Ecclesiastes 9:11-12*

How much do you earn? Most of us like to keep that information to ourselves, but to negotiate a raise, a bonus or a new job salary, you need to know how well other senior-level IT executives are compensated. Human resources executives and CEOs must also have a handle on IT executive salaries to ensure that they are attracting the most talented personnel and paying them appropriately. So, *CIO* set out to compile the most comprehensive statistics on IT executive salaries.

With an impressive response rate to our salary survey, we were able to ascertain responses from every region of the country, every industry and every high-level IT job function. That allowed us to cross-tabulate a multitude of data and explore correlations between salary levels and education, age, gender, experience, size of company, budgets and other factors. A summary of the findings begins on Page 28.

If you want to explore the salary yardsticks in more detail to benchmark against individual experiences and backgrounds, or if you manage salary evaluations, I urge you to order the complete 1996 CIO Executive Compensation Survey, which totals more than 400 pages of data. The cost of the survey is $795 and can be ordered by calling Lisa Kerber, administrative assistant, at 508 935-4449.

P.S. Be sure to join us March 17-20 at the spring CIO Perspectives conference, "The CIO and Cyberspace: The Business/Technology Intersection," in Naples, Fla. We will explore the executive's role in Web/Internet corporate initiatives. For more information, call 800 366-0246.

PHOTO BY WEBB CHAPPELL

Coming In CIO

Group Dynamics

Workflow programs, calendaring and scheduling software, bulletin boards, shared databases or e-mail—if you're applying a technology for collaborative work, you're talking about groupware. *CIO*'s annual software issue defines some of the major categories of groupware and explores its practical applications. It also examines the technological challenges of organizationwide deployment as well as the personnel issues arising from wholesale organizational change. And we'll look at a looming threat: Is the World Wide Web a viable medium for collaboration, and could it make groupware obsolete?

A Whole New Ballgame

As companies battle to stay competitive, big corporate marketing departments with mass-marketing strategies have become a luxury. One new strategy is teaming product managers and IS specialists to create a marketing function that is fast, cost-effective and more precise in targeting customers. But it isn't easy—it can mean a total marketing revamp and greater demands on IS to deliver technology-driven marketing initiatives.

Mind Expansion

How intelligent are you? More precisely, how are you intelligent? Howard Gardner, a Harvard University psychology professor and author, believes in eight distinct "intelligences" that transcend traditional views.

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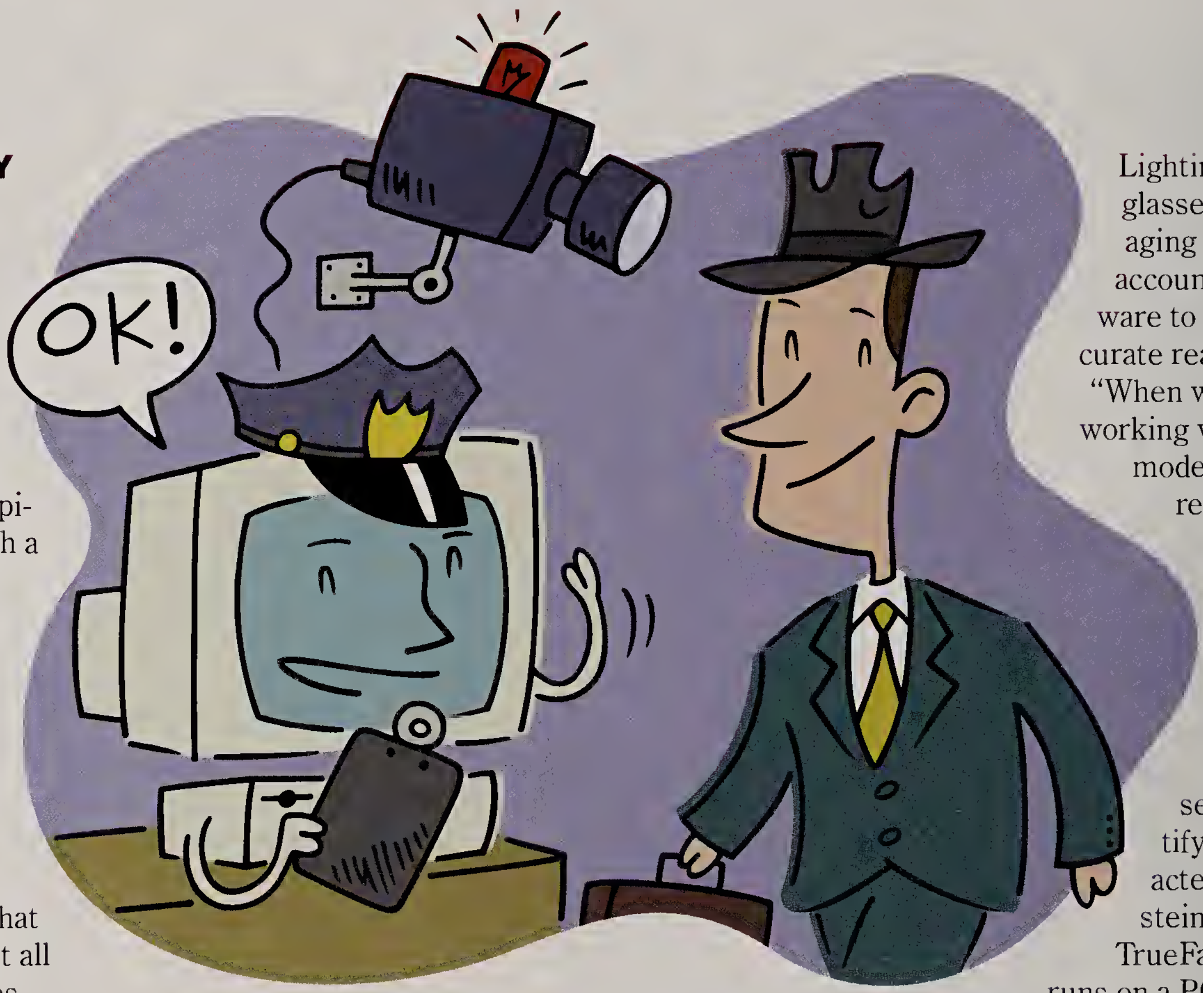

In case you had plans to duck south over the border, walk into a hospital and dash back out with a healthy transplant liver tucked under your arm, forget about it. The look on your face would give you away before you made it past the door. Mexican hospitals are one of the first customers of a new face-recognition technology that helps businesses prevent all sorts of security breaches—in this case, the theft of donated organs.

The software, the result of two decades of collaboration between researchers in image analysis and computational neuroscience, can detect faces in a crowd and then identify a person in real-time for nonintrusive security observation. It can also be used to read an ID card with image data to monitor admission to limited-access locations.

First to the commercial market, Wellesley, Mass.-based Miros Inc. started shipping its software in December 1994 and has since sold the product to more than 50 companies. "The price of the software is just $1,950, the same as other biometric software products [such as fingerprint recognition software]," says Michael Kuperstein, president and CEO of Miros.

Customers include Goddard Technology Corp. in Greenville, S.C., which is using the software in immigration applications, and VSE Corp. in Alexandria, Va., which is developing law enforcement applications. Just as the Mexican government bought the software last year for hospitals to verify staff members in operating rooms, information systems shops are looking into using the software to control access to computers, says Kuperstein.

Built for automated applications like automated teller machines or building access monitors, the Miros system stores an image with ID data on a magnetic strip. To gain secure access, the card holder inserts the card into a kiosk or a reader at the door. A camera records the image of the person and a computer compares the image from the camera to the one on the magnetic strip. Lighting, makeup, glasses, hairstyle and aging are taken into account by the software to ensure an accurate reading.

"When we first started working with neural net models on character recognition, the job required a $25,000 specialty [image] processor, and the computer took three seconds to identify a single character," says Kuperstein. Now Miros' TrueFace software runs on a PC and can scan as many as 200 faces per second.

Other developments in commercial face-recognition software hail from Germany and Southern California. A product called ZN Face was developed by Ruhr University in Bochum, Germany, and the University of Southern California. It has since been sold to Deutsche Bank AG for a security application.

The Massachusetts Institute of Technology's Media Laboratory has also developed face-recognition software called Photobook. It has been tested by the Massachusetts Registry of Motor Vehicles to make sure that people who say they have lost their driver's licenses are actually who they say they are. Eastman Kodak Co. licensed Photobook last year and plans to offer security applications to credit card companies.

–E.B. Baatz

> **"People are pushing more video and graphic material over the Internet. This requires high bandwidth, and there's a finite amount of bandwidth on any network. I believe the Internet is very close to where the phone companies are on Mother's Day. They can just barely tolerate the traffic."**
>
> *–Andrew Seybold, editor of* Outlook on Communications and Computing, *as quoted in* Investor's Business Daily, *Dec. 28, 1995*

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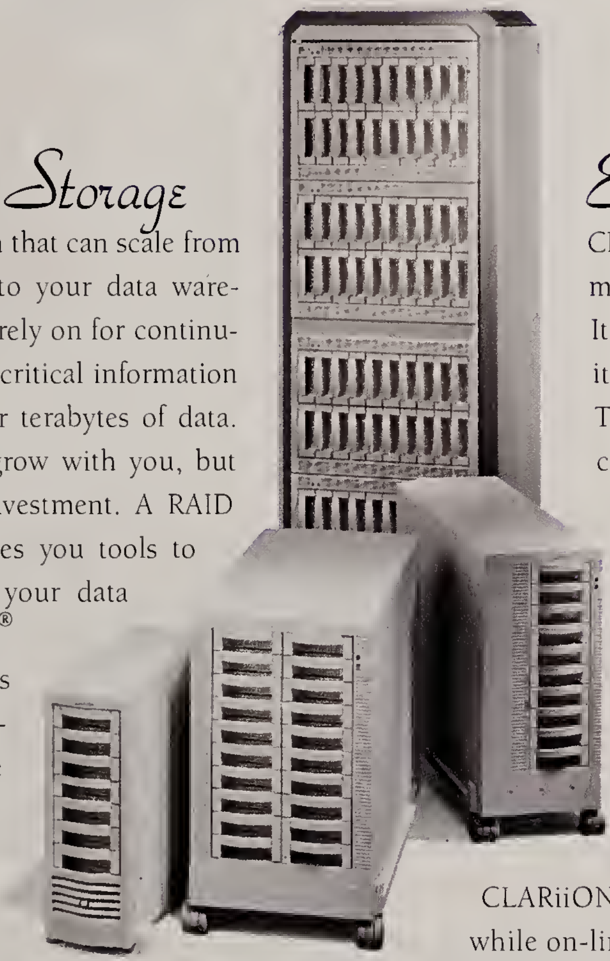
THINKING *Enterprise* STORAGE



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REAL HELP FROM A VIRTUAL WORLD

Virtual reality has opened new dimensions for engineers, artists and teenage game addicts by bending physical-world boundaries of space and place. In its latest wave, the technology is shrinking, even smashing, barriers for disabled people as well.

Researchers nationwide are experimenting with VR projects designed to help liberate adults and children from a variety of disabilities.

VR typically creates a simulated three-dimensional environment that seems to envelop the user. "It has a lot of promise in education and in making other aspects of the physical world more accessible" to people with various physical, mental and emotional disabilities, says Kenneth Nemire, president and CEO of Interface Technologies Corp. of Capitola, Calif.

Among them is Interface Technologies' Virtual Environment Science Laboratory. The project, currently being tested, creates a 3-D world in which youngsters can, for instance, learn physics concepts by "piloting" a spacecraft or "riding" a comet. Students can interact with the system verbally or manually, using a joystick or similar device.

In another pilot project, the nonprofit Starbright Foundation and several high-tech companies invented a 3-D "playground" for children in hospitals from Pittsburgh to Palo Alto, Calif. Starbright World users can play games with other youngsters, explore imaginary locations or take virtual field trips to real-life locations such as Nickelodeon Studios in Orlando, Fla. Even kids too sick or too young to type can navigate the network by using voice commands, a mouse, joystick or other specialized devices.

At the Oregon Research Institute in Eugene, people learning to use wheelchairs

---

OF THE NET, BY THE NET, FOR THE NET

If you could walk a mile in your senator's shoes, would you at least be able to shuffle forward a bit rather than do the waffling polka in place for months? Here's your chance to prove it: A free online game called *Reinventing America* is giving any Joe Schmoe with a modem an opportunity to weigh in on the issues shaping the country's future, from budget deficits to welfare reform.

After registering through Time Inc. New Media's Pathfinder Web site, *http://www.pathfinder.com/reinventing,* players can vote, partake in debates with policy experts and, through online chats, bluster to match the windiest of their real-world counterparts. Players can jump in and out of the simulation without penalty based on their interest in the week's topic.

The game was created by Crossover Technologies Inc., a New York developer of interactive entertainment and information products for new media, and The John and Mary R. Markle Foundation, a private grant-making foundation in New York that promotes the use of interactive technologies to advance political participation.

Tens of thousands of players have logged into the Web site, which creates a fictional America (complete with fictional senators) that reflects players' choices. Most notably, Net representatives have voted to legalize marijuana and slash both the operating budget and salaries of Congress.

"Now we're getting into complete fantasy," Crossover Technologies President Eric Goldberg says of the salary cut.

More than 30 policy experts, including former New York Governor Mario Cuomo, will go online to chat with the masses, giving players a chance to learn about issues without the media as a translator. Creators hope the game will debunk misconceptions the electorate has about its government. They also plan to send players' recommendations to Washington politicians when the game ends.

The game, which began in November, ends in May when players will negotiate to reconcile the budget impact of their decisions. Any chance of déjà vu deadlock in the online world?

"Theoretically we would allow them to come to no resolution, but the game is geared toward compromise," Goldberg says. "If people really can't reach a consensus, I guess we'll end up telling them, 'Congratulations, you just proved you're just as bad as your elected representatives.'"

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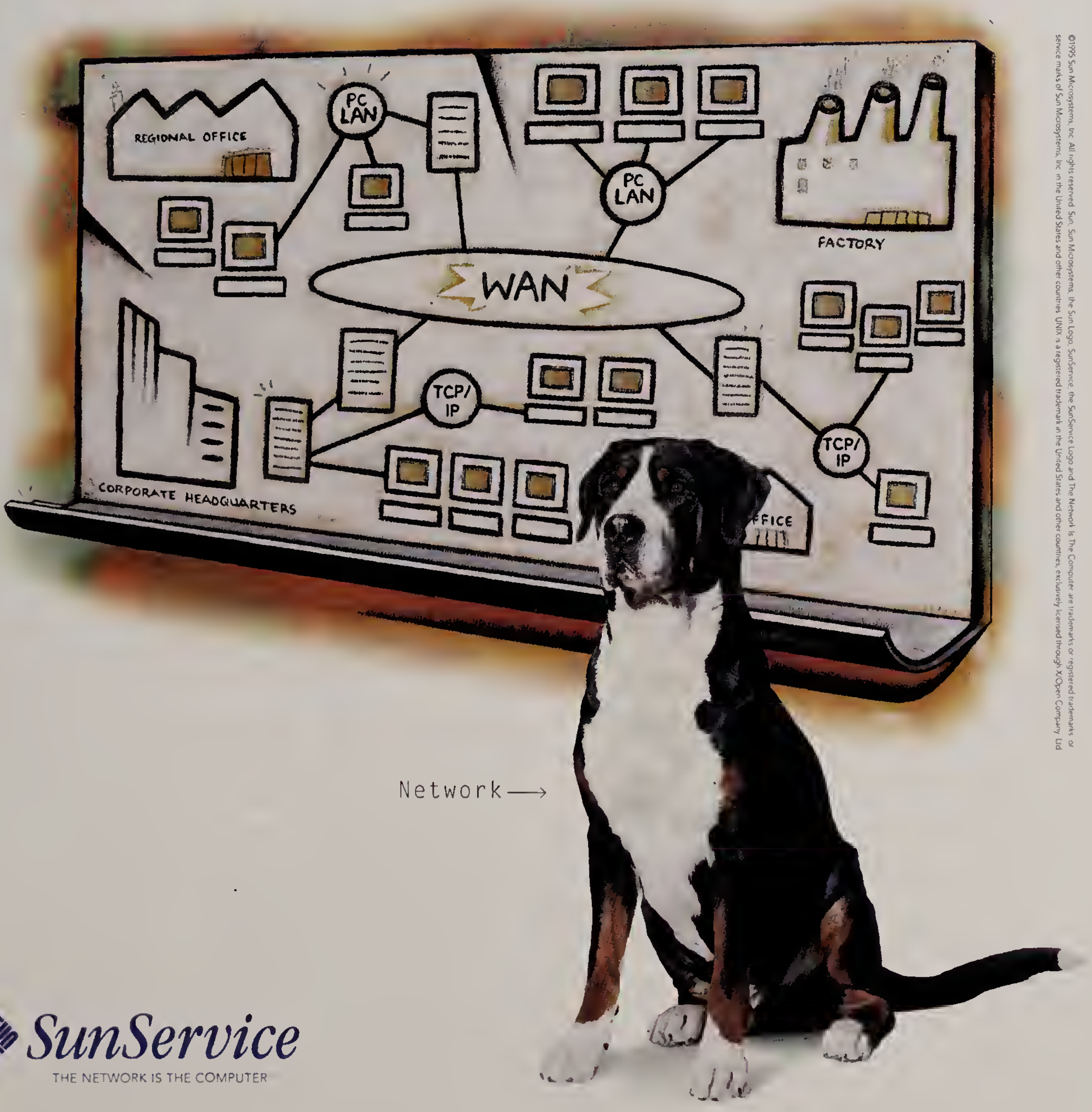

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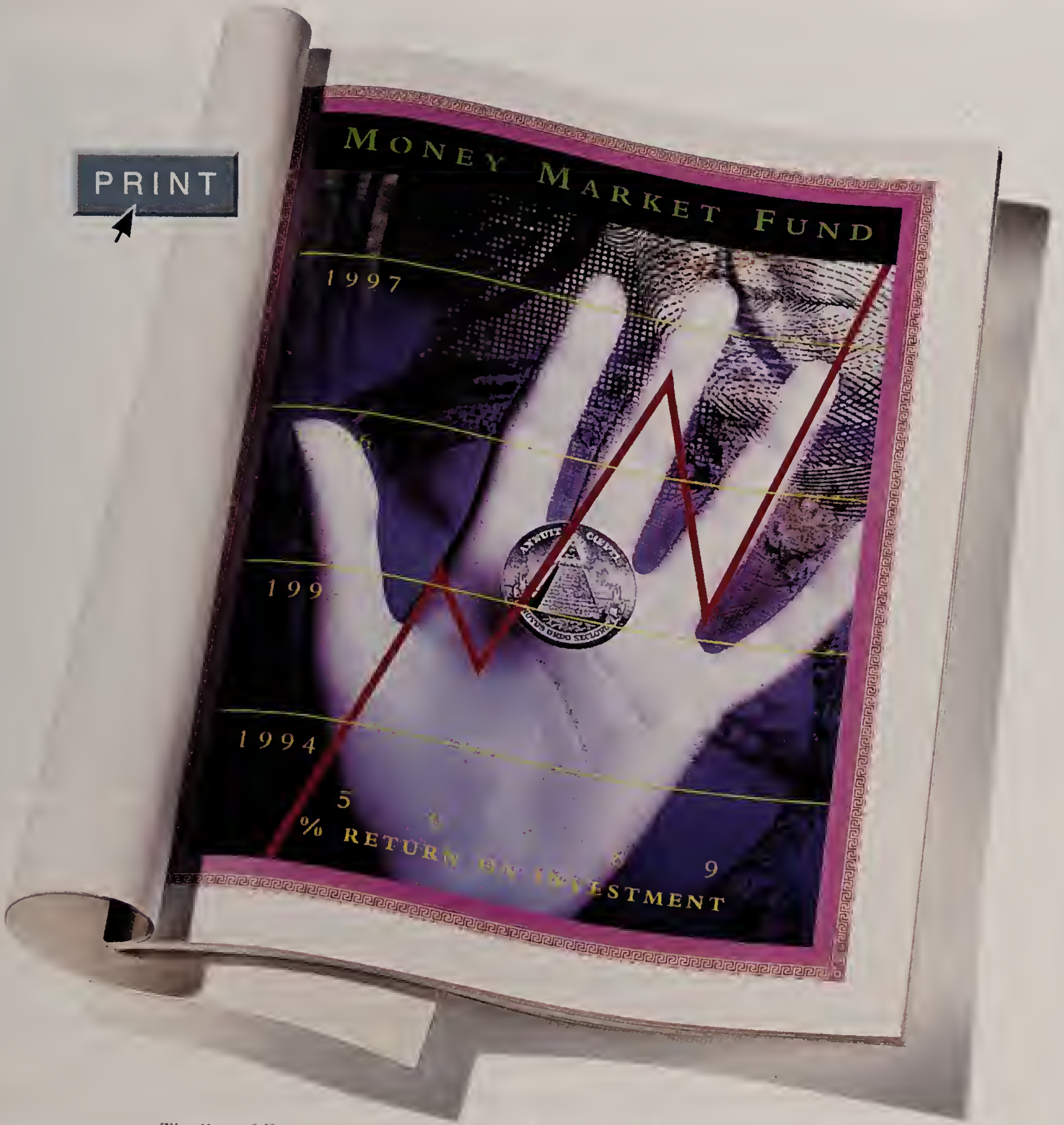

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TRENDLINES

can practice negotiating virtual narrow hallways, tight corners and steep ramps before hitting the road for real.

In Ohio, University of Dayton researchers have used a virtual-reality simulation to help disabled teenagers rehearse traveling by bus until they're confident enough to try it in the real world.

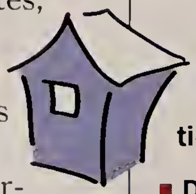
Greenleaf Medical Systems of Palo Alto, Calif., has developed several VR medical devices, including the DataGlove, which translates hand gestures to spoken words.

VR also lets people with cerebral palsy or paralysis design computer graphics or experience "running" a marathon or "playing" a musical instrument. In addition, the technology can simplify complex tasks for people with learning disabilities or brain damage.

Initially, it may seem that VR—which depends heavily on graphics, full-motion video and other visual stimuli—offers little help for the blind. But advocates say the technology holds promise there, too. For instance, recordings of reflected sound inside a building, or an "acoustic map" would allow people to practice navigating through unfamiliar buildings with "acoustic clues," says Greenleaf Medical Systems CEO Walter Greenleaf.

Advocates say that as new technologies evolve, engineers must build broader access into them. Otherwise, as Greenleaf notes, each evolution simply erects new barriers.

Meanwhile, projects in progress indicate that there's nothing virtual about VR's potential to create new dimensions for the disabled. *–Anne Stuart*



KEEPING SECRETS FROM PRYING SPIES

Hidden cameras, disguised intelligence agents and devious plots to steal secrets may be fodder for spy novels and Bond movies, but they also pose more than a fictional threat to American companies doing business abroad. Industrial espionage has become an insidious menace because of easier access to inexpensive, sophisticated technologies and the increasing number of business travelers carrying sensitive information. According to the American Society for Industrial Security, the number of U.S. businesses reporting losses of proprietary information has more than tripled in the past two years, mainly because of thefts abroad. Thefts reported in the trade company's survey rose from 9.9 per month in 1992 to 32 per month in 1995.

"Nobody has been able to put an exact dollar amount on or accurately assess the frequency and prevalence of corporate espionage," says Tatiana Gau, executive vice president of The Parvus Co., a private investigation firm. "Very rarely do companies have proof of infiltration or theft of information; usually they do not even realize it has happened. And those that are aware don't go public with the information because they're worried about their stockholders."

Here are tips from experts on how to protect your top-secret corporate information when traveling:

- **Don't stay in first-floor hotel rooms.**
- **Don't accept a hotel room if the desk clerk loudly announces your room number.**
- **Be aware that hotel phone and fax lines can be tapped.**
- **Never leave your laptop computer unattended.**
- **Be aware that some governments have converted their Cold War intelligence networks to help support local businesses. Any U.S. company that does business in France or is a direct competitor of a French company can expect to be targeted at some point by industrial espionage, according to Gau. Russia, Japan, Israel and Germany also are high-risk countries, she says.**
- **Be careful on airplanes and in airports. In 1992, the Canadian government reported that the French intelligence service was bugging airline seats and sending agents undercover as flight attendants.**
- **Watch out for tiny surveillance tools. Penlight cameras placed above airline seats, for example, can make readable photos of laptop screens. Consider buying a privacy screen, which limits the angles from which content can be viewed.**
- **Look for gadgets in hotel rooms, such as a three-plug outlet plate that fits into a wall socket and supplies electrical power while doubling as a microphone.**
- **If you're carrying extremely sensitive information, change hotels at the last minute and don't make reservations in your company's name.**
- **Don't discuss confidential information in bars and restaurants.** ■

ILLUSTRATION BY DAVID BAMUNDO

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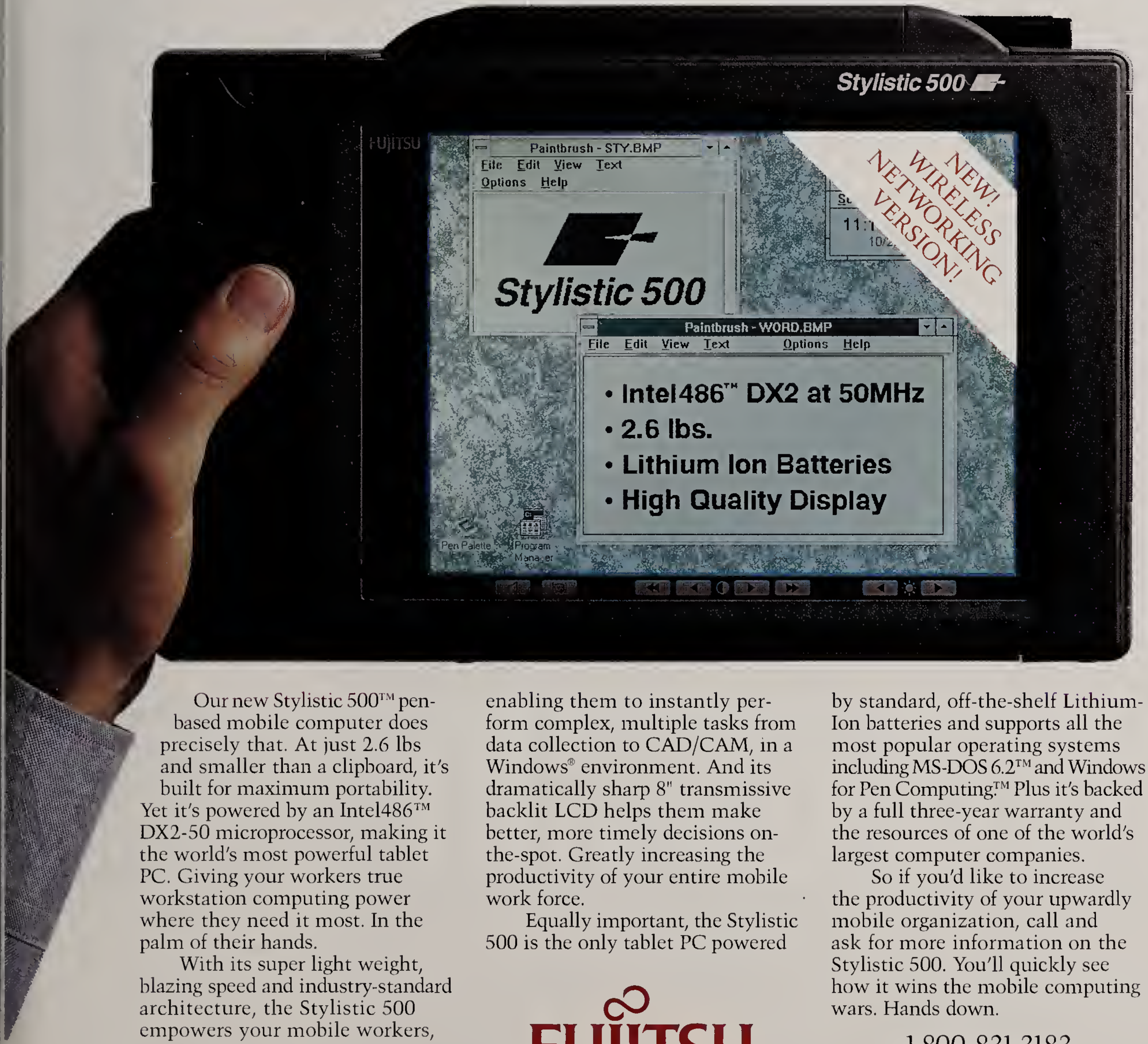

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PLUGGED IN

CABLE-READY CAMPUS

In an experiment that may prove to be the blueprint for wiring digital-savvy communities in the future, Boston College has become the first school to plug its entire campus into full Internet, voice, data and video service using cable modems.

The new infrastructure, created with the help of Boston-based Continental Cablevision Inc., not only meets the current demand for technology but is also capable of accommodating future technology requirements.

Dubbed "Project Agora," the comprehensive package of communications services includes Internet access, voice mail, electronic mail, cable TV and phone service for all undergraduate students. According to Boston College IS staff, the university is the first to have voice, data and video service built into its infrastructure for students. In future phases of the project, the college's wired community will expand to include graduate students, alumni and neighboring schools.

For its part, Continental Cablevision created a full-service network for BC to deliver video and data services with the option of adding voice capability to it at a later date. To do so, it replaced typical telephone lines with cable modems in more than 2,100 dormitory rooms, 2,500 classrooms and 400 offices on campus for receiving data and video.

The design involves a dedicated fiber-optic ring architecture from Continental's Network Control Center in Needham, Mass., out to the college's on-campus hub site. From there, 18 independent fiber nodes are deployed across the campus, each feeding separate coaxial systems to drop locations. Students can access library resources and other students and faculty on the network over the same cable used for data and video.

Off-campus, professors can use the same on-campus network from their homes via Continental's cable system, says Rick Jenkinson, New England regional director of government and public affairs for Continental Cablevision. "What's exciting is that this is not a test, it's real. What you see at BC will eventually be seen in all the communities we serve."

Services and technical support delivered by Continental include:

- Data transport over an asynchronous transfer mode (ATM) backbone, which carries data up to 1,000 times faster than conventional telephone lines and allows connections to be upgraded to full ATM in the future with little additional cost for voice;
- Ethernet access to residence halls, including more than 10,000 service outlets via the cable network;
- Ethernet speed connections to be expanded to full ATM (155 Mbps);
- An 80-channel analog system that can be upgraded to a 720-channel digital interactive system; and
- Six channels of in-house programming specific to the Boston College community.

"The goal of Project Agora, which takes its name from the Greek term meaning 'gathering place,' is to create an electronic community where people can gather to exchange information and ideas, not simply connect to the information superhighway," says Bernard Gleason, executive director of the office of information technology at BC. "We have a community of 18,000 individuals here, which can be compared with many towns in America. Project Agora is a perfect example of the technology and integrated services that will exist someday in communities across the nation," he adds.

Project Agora, which was undertaken without adding university staff, enables students to access voice, cable and data services in a do-it-yourself fashion. According to Gleason, more than 6,000 students registered themselves to the campus phone system over the Labor Day weekend in 1995. In 1994, it took 4,000 students nearly 90 days to connect using the regional Bell carrier. "The service is now as much a part of the residence halls as are heat and electricity," says Gleason.

–Elaine M. Cummings

BUT WAIT! IT'S A RADIO, TOO

In a step that inches technology still closer to the inevitable omni-computer that slices, dices and whips up brunch for 10, the folks at Philips Semiconductors have figured out how to turn a PC into a radio.

The company's technology couples "Smart-Radio" components for high-quality radio with text capability for PCs. The result: Computer manufacturers can now deliver stereo radio as well as digitally transmitted text from a broadcasting station to computers with Philips' new Radio Broadcast Data System (RBDS) Radio PC Card, which uses the OM5604 multimedia module.

Users working at PCs can listen to the radio through their computers while they work in other applications. If listeners hear a catchy song, they can click on an icon to display such information as the name of the radio station, the artist's name and song title. Listeners can also receive messages about traffic, weather and emergencies.

To ensure that users will have access to a broad selection of stations offering this audio/visual-display broadcast capability, the Electronic Industries Association is supporting the RBDS standard by launching a $1 million campaign to install hardware encoders in top U.S. radio markets. The cost of the Smart-Radio module is about $30. Visit Philips' home page at *http://www.semiconductors.philips.com/ps/* for more information. ■

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Gartner View: Saving Grace

Here are 16 ways to save money on IT expenditures

BY JERRY COOPERMAN AND KEN McGEE

Companies with a dismal bottom line are not the only ones under strong pressure to save money these days. Regardless of its financial profile, the typical IS organization is promoting the concept of "cutting costs without cutting corners" as critical to the planning, design, implementation, operation, management and evaluation of enterprisewide technology. As a result, financial belt-tightening has evolved into an issue of not only how to save more money but also how to do better with less.

It's possible for IS organizations to reduce expenditures in dozens of ways without harming employee productivity or services. Here are some of the cost-saving hints that Gartner Group suggests to its clients:

Simplify transmission protocols. Enterprises can reduce transmission costs by using appropriate communications protocols to send information over the public network. For example, bandwidth-intensive transmissions—such as sending image files—should use JPEG, the compression standard established by the Joint Photographic Experts Group. Compression reduces file sizes up to 35 percent and results in a corresponding reduction of transmission time. Less time means less money.

By using frame relay networks, Gartner Group clients have enjoyed savings of more than 30 percent in their leased-line costs.

Ensure that telecommuters are full-time telecommuters. The much-touted 60/40 rule—60 percent of a telecommuter's time is spent in the office, 40 percent in the home—is not fiscally sound. The problem is that telecommuters required to spend significant time in the office expect a fully equipped office area. That expense, added to an investment to outfit the home office, quickly erases any planned savings from telecommuting.

Plan equipment or software purchases carefully. Timing is critical in purchasing and generally yields additional discounts. Gartner Group continues to see slight increases in discounts at the end of each month. The discounting by suppliers is often even better at the end of a sales quarter. Traditionally, suppliers are most aggressive with discounts at the end of their fiscal years. Other events can increase negotiating leverage, too. In the notebook computer arena, for example, enterprises get the best prices when they time their purchases to correspond with Fall Comdex and the spring industry trade shows, such as CeBIT, PC Expo and Spring Comdex. At these shows notebook manufacturers typically make price/performance improvements to their lines.

Timing also applies to software negotiations. Knowing the "tricky quarters" for each supplier and negotiating at these times or at the vendor's fiscal year end improves the chances of getting favorable terms and conditions. Computer Associates International Inc. and Microsoft Corp., for instance, have the toughest time reaching their revenue growth and profitability goals in the first quarter of their fiscal years. Novell Inc.'s toughest quarter, on the other hand, is the fiscal third quarter.

Consider buying through the secondary market. The secondary market for used IT equipment is often overlooked. Enterprises can use the secondary market to sell older IT equipment or check the trade-in values offered by a supplier. The secondary market is also viable for procuring entire systems, such as telephone systems or add-on components. The secondary market frequently offers good used equipment, complete with guarantees, for far less than regular retail channels. For example, in situations where 14-inch screens are adequate, Gartner Group recommends that enterprises consider buying used 14-inch monitors, which are available for up to 60 percent less than the average cost of a new monitor.

Prenegotiate trade-in values. IT financial managers and network planners are challenged by the ever-shorter life cycles of the equipment being installed. The majority of equipment used in client/server applications, for example, has a useful life of three years or less. If a department elects to purchase client/server equipment, costs are often depreciated over a five-year period by the accountants, even though the department's budgets may be adjusted to the shorter useful life. When it comes time to install next-generation products, the enterprise is faced with unamortized value, which may inhibit the equipment replacement. By negotiating preset trade-in allowances at purchase time, such challenges can be overcome.

Include a grandfather clause in contracts. A pricing-model change can cause a standard contract item to become an optional feature or function for an additional cost—hitting an unprepared enterprise with an expensive surprise when it tries to upgrade the product. When a system is purchased with a grandfather clause pertaining to price/capacity model, the full capacity and functionality is implied. If a feature or function becomes optional, the enterprise is not charged for actual usage levels when it upgrades. Additionally, the enterprise receives significant discounts until the full original feature or function levels are achieved. This gives the enterprise the option to select either the grandfather or the new pricing model.

Mergers, buyouts and consolidations will make most of the niche utility vendors obsolete in the next couple of years.

Include a transferability of licensing clause in contracts. Transferable licensing protects equipment residual values by giving an enterprise the ability to transfer some portion of its software licensing fees when selling or buying equipment from the secondary market.

Stick with the LAN management tool leaders unless a niche product's payback is within 12 months. LAN management toolsets, which were low-level utilities a few years ago, are evolving into comprehensive management suites that incorporate a range of functions for local and remote management. With this shift, IS organizations are beginning to get the kind of tools they need to manage LAN environments properly. By the end of 1996, IS organizations should be able to get tools with even more functionality as vendors in the highly competitive LAN management market enhance their products to stay ahead of the market curve. But along with that competition, mergers, buyouts and consolidations will make most of the niche utility vendors obsolete in the next couple of years. As a result, if an enterprise cannot afford to throw away the niche product in a year, it shouldn't buy it.

Don't accept a software vendor's first offer. Because of mergers, buyouts and continuing pressure from Microsoft, the software market is more competitive than ever. Push back on terms and conditions offered by such leaders as Symantec Corp. and McAfee Associates Inc. They will deal. Even if one vendor's product is favored, get a bid from another vendor. If a better deal is found, go back to the first vendor and ask it to match the bid. More than likely, the vendor will.

Establish clear and concise Internet goals. Almost every enterprise is contending with the issue of Internet access. An alarming number of enterprises, however, don't know which Internet applications they need. Frequently, all the IS manager is told is that one of the enterprise's top executives has decreed that, "Our organization just has to get on the Net!" Knowing which applications the enterprise requires from the Internet—e-mail, outbound access, inbound access, electronic commerce and so on—will help determine the amount of access to order and enable the enterprise to avail itself of other value-added services, such as security firewalls.

Standardize desktop equipment. If an enterprise installs standard IT products, it will experience standard problems and will thus be able to use standard (read "less expensive") solutions. Through rigorous standardization of their desktop systems—including hardware, user interfaces, applications infrastructures and processes—Gartner Group clients report a 30 percent reduction, equivalent to $2,300 per user per year, in total cost of ownership. Although much of this savings comes from volume purchases of standard equipment, the intangible or "soft" impact on end users and IS support staff delivers even greater benefits over the long

Cost-Cutting Blunders

IS executives take note: Even the most simple cost-cutting measures can have enterprisewide impact

Too often, enterprises take a tactical approach to saving money and end up with big headaches and unexpected expenses in the long run. Below are some common blunders that enterprises make when trying to save money.

- Moving to client/server technology for improved economics, not new functionality
- Reverting to traditional data center operations and letting business units develop what they need on their own
- Cutting back on training and new technology investment without considering the effect on networked computing
- Outsourcing without maintaining a strong oversight group
- Outsourcing without an adequate contract to meet future needs and without defined metrics to measure results

term. These benefits include reduced training time, increased flexibility, faster development cycles, faster problem resolution and improved reliability.

Buy automation products. IS organizations should invest in automation tools or process management products—centralized backup and restore processes, centralized software distribution, inventory and software metering packages—whenever possible. Such tools simplify operational procedures and often pay for themselves in one execution. For example, in the help desk arena, automation tools give help desk analysts powerful tools for solving problems, increasing the first-call success rate, retaining the knowledge gained in the organization and leveraging that knowledge. These tools also improve the quality and consistency of support and help pinpoint end-user training requirements.

Recognize the emergence of desktops as user interface servers. User interface server technology delivers benefits in the form of increased manageability and network flexibility. This technology is particularly applicable for corporate back-office environments, where users need little offline processing and share most application needs. Gartner Group advises its clients that limiting the role of the desktop to the user interface server will become the physical architecture of choice for fully connected back-office systems by 2000. Back-office organizations should plan to migrate to this technology through commercially available products and through adoption of these concepts in application designs. For many environments, this will break the cycle of endless desktop upgrades as the only way to deliver advanced functionality to end users.

Acknowledge frame relay transport's affinities to SNA. Widespread use of frame relay networks by IBM customers has already begun—for good economic reasons. Introducing a frame relay "cloud" in the middle of a Systems Network Architecture (SNA) backbone allows mesh connectivity through logical pipes, such as virtual circuits, rather than solely through physical devices, such as Synchronous Data Link Control (SDLC) circuits. Saving ports on the communications controller enables an enterprise to increase the speed of the access line while ducking an expensive 3745 front-end processor upgrade. The associated costs for the leased lines typically drop, too. For instance, by using frame relay networks, Gartner Group clients have enjoyed savings of more than 30 percent in their leased-line costs. In many instances, enterprises find that frame relay can be run on much of their equipment with only software upgrades. Because of frame relay's robust support of multiple protocols and its future as a key feeder technology to asynchronous transfer mode, adopting the technology is also a savvy strategic move.

By leveraging metering products, enterprises with 1,000 to 3,500 users save $500,000 to $1.2 million annually in desktop software license fees.

Install a software metering package to reduce license fees. Asset and network managers can reduce software license fees and support costs by using a server-based software metering package to measure usage levels on distributed client/server networks. In addition, metering plays a complementary role in security, distribution and inventory control and can be used to enforce limited-use and site licenses. By leveraging metering products, Gartner Group research shows that enterprises with 1,000 to 3,500 users save $500,000 to $1.2 million annually in desktop software license fees.

Aggregate network services and hardware requirements across the enterprise. Given today's heightened network competition in the face of forthcoming deregulation and the maturation of network outsourcers, it is astounding how many enterprises do not have a consolidated view of their network services and hardware requirements. Services and equipment acquisitions are still being negotiated and contracted for by separate departments and lines of business. Enterprises that do not effectively identify and aggregate their business units' networking services and equipment requirements will miss the opportunity to save up to 40 percent on the deal, equivalent to millions of dollars for a large enterprise.

As these points show, whether the focus is hardware, software or personnel issues, opportunities exist for even financially healthy enterprises to reduce spending. But to succeed, an enterprise must have established the most critical aspect of any money-saving strategy: an effective structure for implementing cost-cutting measures. This framework must address such issues as project prioritization and selection, resource planning, risk assessment and project management. Not only will the framework help the enterprise devise an orderly project prioritization strategy, it will lay the groundwork for a well-run, cost-effective IT environment. CIO

EDITOR'S NOTE: *With this look at IS cost containment, we continue a series of briefings authored by Gartner Group on what CIOs should know and do about assorted technology developments. We look forward to hearing what you think about this new column. Please contact CIO Editor Abbie Lundberg at 508 935-4731 or* lundberg@cio.com.

Jerry Cooperman and Ken McGee are vice presidents and network business management research directors at Gartner Group Inc. in Stamford, Conn. They can be reached at 203 316-1111.

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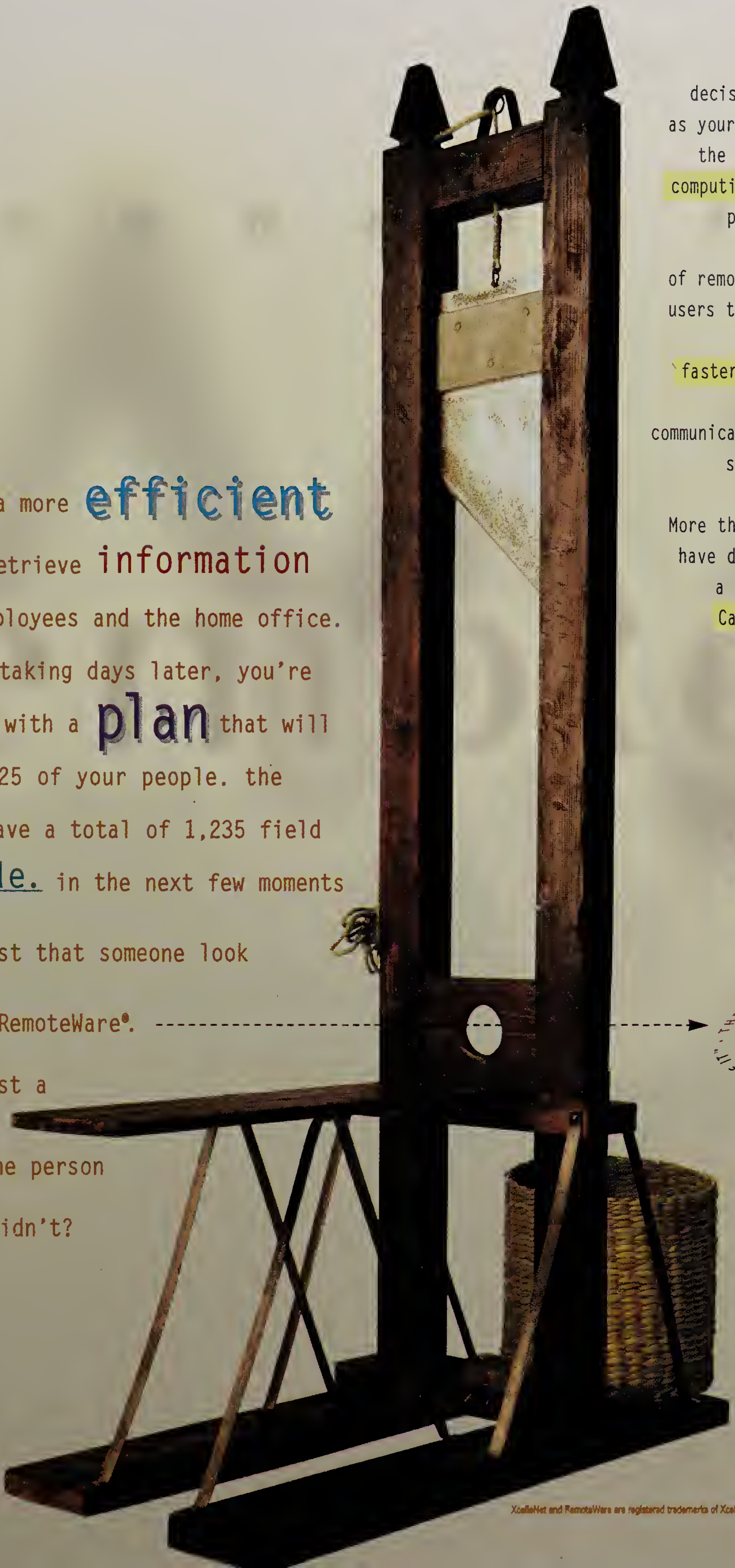

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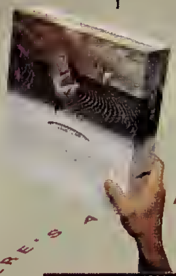

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The highest-paid IS executives have the word "chief" in their titles, work for large companies and are willing to move, according to *CIO*'s first executive compensation survey. Perhaps not surprisingly, gender and age are still factors.

Full Market VALUE

BY E.B. BAATZ

YOU WORK HARD FOR YOUR MONEY. But even a newly minted college graduate soon discovers that hard work rarely makes the difference between the highest paid and the lowest paid, particularly when the jobs are executive information technology positions.

HOW DO YOU MEASURE UP?

What matters most? Position, position, position. Indeed, according to *CIO*'s executive compensation survey of more than 1,000 readers, conducted between September and October 1995, people with the title of chief information officer earn 17 percent more on average than vice presidents of information systems, 60 percent more than chief technology officers and a whopping 91 percent more than directors or managers of IS.

One reason CIOs do so well, of course, is the fact that millionaire salaries are not out of the question for corner-office execs at big companies. On average, chief information officers pull down salaries and bonuses of only $146,900 per annum, but the highest-paid CIO of the 136 surveyed makes nearly $1.7 million. (Unfortunately, this person was so busy that he did not turn in his survey response in time to be included in the official tabulations. Otherwise, the "average" of $146,900 would have been significantly higher.)

The next highest-paid CIO who answered the survey—and was included in the tabulations—makes $850,000, with a substantial portion of his compensation, 75 percent, received in the form of a bonus. And like most others in the richest ranks, the highest-compensated executive works for a big company (more than $1 billion in revenues), oversees a healthy budget (more than $100 million) and supervises lots of employees (more than 500). After the title, it's size, size, size that determines the biggest salaries.

But the "chief" title doesn't always guarantee the biggest paycheck. The average chief technology officer (a title that accounted for less than 2 percent of the entire sample of survey respondents) makes just $92,100. And the highest-paid CTO rakes in a relatively modest $185,000 per annum. Interestingly, CTOs said their most important job functions are adding value by leveraging IT and aligning IS with business goals—the same as the top two job functions checked off by CIOs.

Compared with CTOs, vice presidents of IS fare much better. Their average annual compensation, based on a response of 215 vice presidents, is $125,800. The highest-paid vice president surveyed makes a healthy $650,000 working for a midsize ($101 million to $500 million in revenues) financial services company. The next highest-paid vice president earns $600,000 for a billion-dollar high-tech manufacturing company.

Waiting in the salary wings, directors and managers of IS make considerably less than their full-fledged executive counterparts. According to the survey of 473 directors and managers, annual compensation for this group averages $77,000.

COMPANY SIZE MAKES ALL THE DIFFERENCE in the world for director and manager salaries as well. About 13 percent of the directors and managers surveyed work for companies with revenues of less than $25 million and make an average of $57,100. Companies with more than $1 billion in revenues pay an average of $97,600, or 71 percent more. The highest-paid IS manager makes a wallet-warming $210,000 per annum.

Finally, to wrap up all the titles in the *CIO* survey, vice presidents, directors and managers of networking and communications receive an average $73,500 in compensation, with the highest-paid networking executive earning $210,000. This was the only job category where the majority of respondents failed to indicate that aligning IS with corporate goals was a number-one priority. Instead, the 60 networking managers surveyed were more likely to identify their most important roles as adding value by leveraging IT, enabling speed and change, connecting to customers and suppliers, and creating an information and communications architecture.

It's probably no surprise that the gender gap persists in the information systems upper ranks. But what a gap: One hundred women answered the survey; with an average salary of only $79,300 (it is $99,900 for men), executive women in IS make 79 cents for every dollar that a man pulls down.

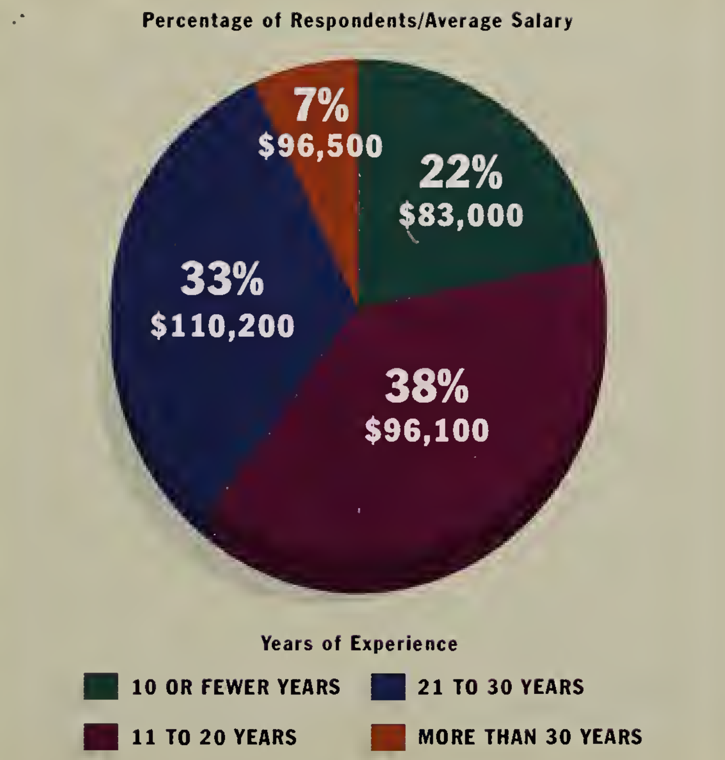
The highest-paid woman in the *CIO* survey makes merely $315,000, with 50 percent of that in the form of a bonus. She has more education than the highest-paid male CIO, she supervises more people, and she is 12 years older, too. But her title remains vice president, not CIO.

Perhaps women who want to make more money should consider carefully the industry they choose to enter. Women who work in IS for high-tech manufacturers, computer services and software companies, and systems integrators and value-added resellers actually make as much as or more than men.

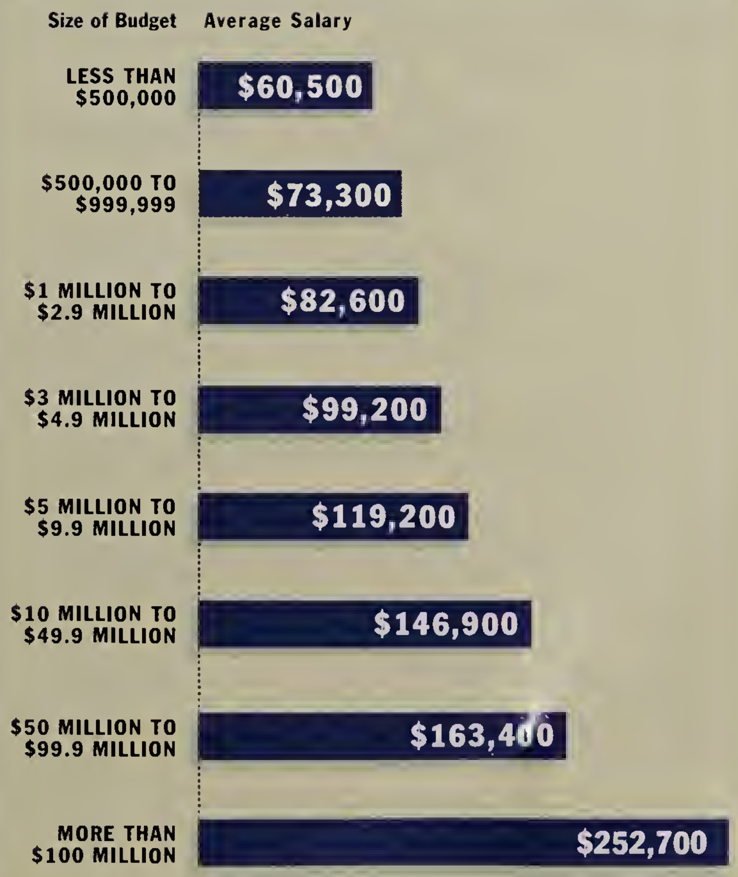
Indeed, high-tech manufacturing, communications services and value-added resellers, distributors and sys-

GO HIGH-TECH, young man. High-tech manufacturing pays the best average salaries ($124,200 per annum) and the highest bonuses (26.6 percent of base pay) of any industry sector. Communications services as well as systems integrators, value-added resellers and distributors also pay fairly high average salaries.

EXPERIENCE PAYS, UP TO A POINT



THE BIGGER THE BUDGET, THE BIGGER THE SALARY



tems integrators are among the most profitable industries for IS executives of any gender. High-tech manufacturing IS execs make an average of $124,200, or 83 percent more than CIOs and IS managers in the government, the lowest-paid sector of the economy.

More than 16 percent of the women surveyed work in government jobs versus 11 percent of the men polled. Government IS executives make the least money of those surveyed, regardless of gender. So the gender gap is partially explained by the industry gap. Still, the $66,800 earned by women in government jobs is nearly 2 percent less than the average $68,000 earned by men.

IN ADDITION TO THE GENDER GAP, there seems to be an age gap as well. IS executives can expect their annual compensation to grow as they age—until the age of 55. From an average salary of $121,300 for IS executives and managers 51 to 55 years old, average compensation drops 12 percent to $107,200 for IS managers over 55. However, 14 IS executives over the age of 60 say they are doing OK, making an average $137,100 per annum.

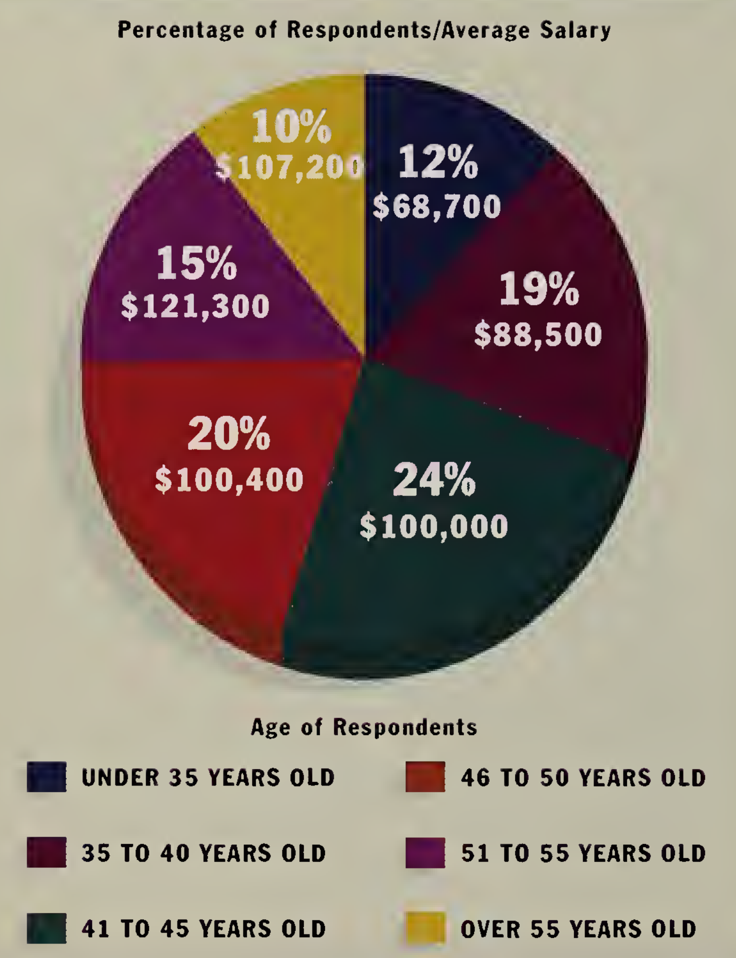
The ability to garner that next promotion and the willingness to change jobs remain important compensation drivers. One-third of the executives in the survey said they have changed jobs or been promoted in the past two years. These movers and shakers are paid better as a result, too. On average, their paychecks are 15 percent fatter than those of executives who have not changed jobs.

By the way, in line with popular perception, CIOs were more likely than other IS executives to have changed jobs or been promoted in the past two years (48 percent of CIOs surveyed have changed jobs). These mobile CIOs have negotiated an average compensation package of $157,000, compared with $137,700 for executives who have not changed jobs. Only 36 percent of vice presidents and 26 percent of directors and managers have changed jobs or been promoted, and their relative lack of mobility results in a far less significant salary differential between the mobile and the stable.

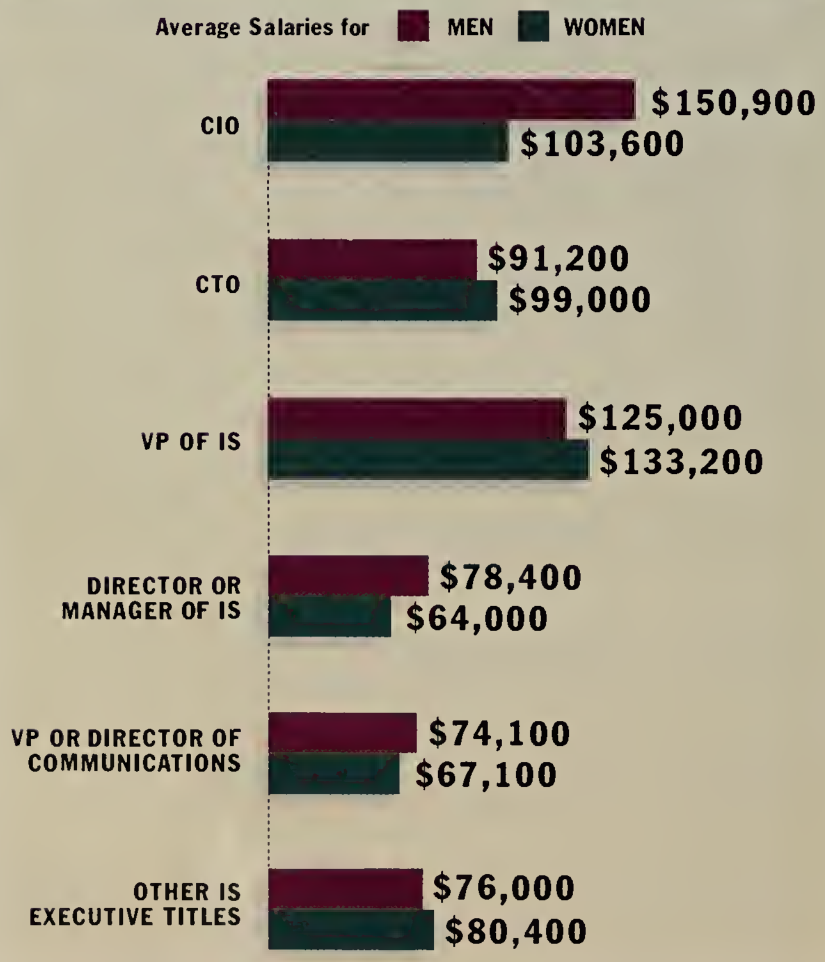
You can't change your gender, your age or maybe even your propensity to move around. Luckily for IS executives, the three most logical compensation parameters remain: How big a budget do you oversee? How many people do you oversee? For what size company or organization do you work? The bigger those numbers, the bigger the paycheck.

THE BEST PLACE to work, in terms of IS salary, is New York, where IS executives make an average of $141,800 and CIOs pull down an average of $209,400. But CIOs in Houston and San Francisco make more money, 35 percent and 7 percent more, respectively.

UNDER 55? PAY WILL GROW AS YOU AGE



THE GENDER GAP PERSISTS



CHIEF INFORMATION OFFICER PROFILE

Average salary: $146,900

WHAT DETERMINES SALARY	AVERAGE SALARY	HIGH SALARY	% INCREASE*
NUMBER OF EMPLOYEES SUPERVISED			
1-5	$75,700	$150,000	10.0
6-10	92,500	130,000	58.5
11-20	125,200	260,000	13.8
21-50	114,400	215,000	9.1
More than 50	188,300	850,000	15.0
GENDER			
Male	$150,900	$850,000	15.0
Female	103,600	170,000	11.2
COMPANY SIZE			
Less than $25 million	$107,600	$200,000	8.5
$25 million - $50 million	98,100	153,000	8.7
$51 million - $100 million	122,200	226,000	10.2
$101 million - $500 million	127,700	260,000	14.0
$501 million - $1 billion	173,500	300,000	19.8
More than $1 billion	237,500	850,000	15.2
EDUCATION			
No college degree	$143,500	$325,000	30.2
Undergraduate degree	148,900	440,000	15.2
MBA	143,700	850,000	12.1
PhD	125,700	224,000	8.7
MOBILITY**			
Have changed jobs	$157,000	$525,000	20.6
Have not changed jobs	137,700	850,000	8.9
MOST IMPORTANT JOB FUNCTION			
Align IS with corporate goals	$159,100	$850,000	13.6
Add value by leveraging IT	166,200	440,000	14.3
Enable change and speed	149,400	292,000	32.7

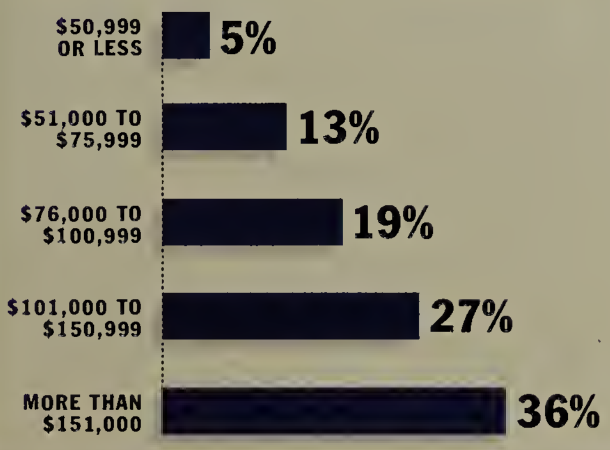
*Self-reported average annual increase in salary over the past two years

**Mobile executives are those who indicated they have changed jobs or been promoted over the past two years.

ONE HUNDRED thirty-six men and women in the survey of 1,000 executives hold the title of CIO. These individuals made the biggest salaries and received the largest bonuses of everyone in the survey pool.

SALARY PERCENTILES

Percentage of CIOs Who Made the Following Salaries



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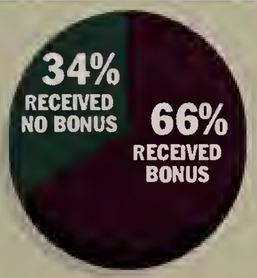


38% RECEIVED AN 11% TO 25% BONUS ON AN AVERAGE SALARY OF $162,500

26% RECEIVED A 26% TO 50% BONUS ON AN AVERAGE SALARY OF $195,900

13% RECEIVED MORE THAN A 50% BONUS ON AN AVERAGE SALARY OF $313,500

CIO FACT: On average, CIOs in Houston make twice as much as CIOs in Boston.

VICE PRESIDENT OF INFORMATION SYSTEMS PROFILE

Average salary: $125,800

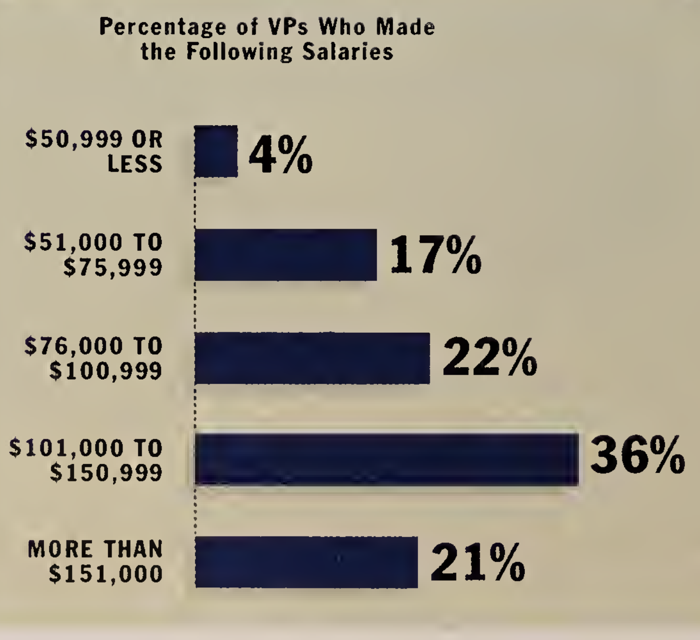
WHAT DETERMINES SALARY	AVERAGE SALARY	HIGH SALARY	% INCREASE*
NUMBER OF EMPLOYEES SUPERVISED			
1-5	$72,000	$125,000	7.8
6-10	94,500	205,000	9.0
11-20	109,700	250,000	13.7
21-50	107,400	183,000	9.8
More than 50	175,500	600,000	13.4
GENDER			
Male	$125,000	$650,000	10.6
Female	133,200	315,000	16.9
COMPANY SIZE			
Less than $25 million	$70,100	$112,000	10.0
$25 million - $50 million	78,400	120,000	11.0
$51 million - $100 million	109,300	250,000	11.5
$101 million - $500 million	129,300	650,000	11.9
$501 million - $1 billion	121,100	262,000	11.9
More than $1 billion	175,700	600,000	11.9
EDUCATION			
No college degree	$118,700	$288,000	9.2
Undergraduate degree	111,300	262,000	10.5
MBA	152,100	650,000	12.1
PhD	122,900	600,000	14.9
MOBILITY**			
Have changed jobs	$131,400	$650,000	13.7
Have not changed jobs	122,600	600,000	9.4
MOST IMPORTANT JOB FUNCTION			
Align IS with corporate goals	$118,000	$400,000	12.0
Add value by leveraging IT	139,700	317,000	11.7
Make IS cross-functional	123,300	250,000	6.3

*Self-reported average annual increase in salary over the past two years

**Mobile executives are those who indicated they have changed jobs or been promoted over the past two years.

THE HIGHEST-PAID male vice president of IS made $650,000 in salary and bonuses last year; the top-paid female vice president made $315,000. But because a greater share of women than men made more than $100,000, the average female's salary stood at $133,200, 6.6 percent higher than the average male's salary of $125,000.

SALARY PERCENTILES



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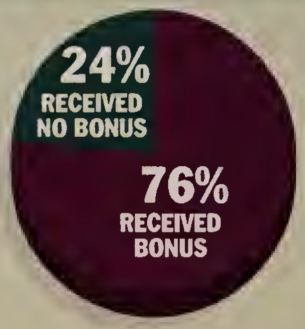

25% RECEIVED A 6% TO 10% BONUS ON AN AVERAGE SALARY OF **$122,900**

33% RECEIVED AN 11% TO 25% BONUS ON AN AVERAGE SALARY OF **$129,400**

33% RECEIVED A 26% TO 50% BONUS ON AN AVERAGE SALARY OF **$178,400**

VP FACT: VPs of IS who have MBAs garner a 37 percent salary premium.

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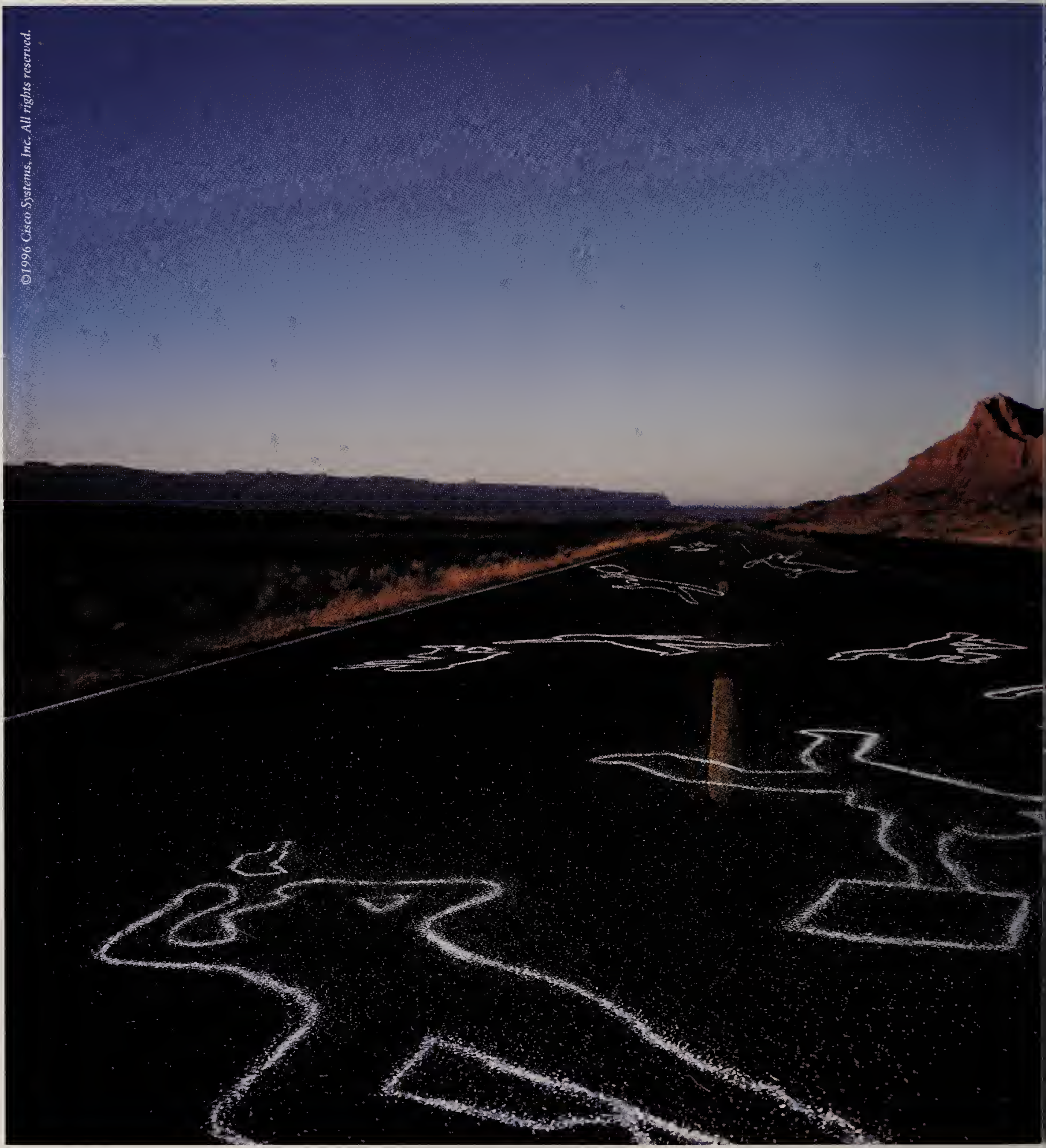

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DIRECTOR OR MANAGER OF INFORMATION SYSTEMS PROFILE

Average salary: $77,000

WHAT DETERMINES SALARY	AVERAGE SALARY	HIGH SALARY	% INCREASE*
NUMBER OF EMPLOYEES SUPERVISED			
1-5	$62,900	$140,000	9.9
6-10	71,600	144,000	10.0
11-20	78,000	180,000	9.4
21-50	86,300	156,000	8.9
More than 50	108,300	300,000	8.7
GENDER			
Male	$78,400	$300,000	9.6
Female	64,000	115,000	10.1
COMPANY SIZE			
Less than $25 million	$58,300	$105,000	13.9
$25 million - $50 million	68,900	145,000	10.4
$51 million - $100 million	70,200	115,000	8.8
$101 million - $500 million	81,500	156,000	8.4
$501 million - $1 billion	86,400	135,000	11.1
More than $1 billion	96,600	300,000	8.8
EDUCATION			
No college degree	$69,900	$150,000	10.9
Undergraduate degree	72,300	156,000	10.1
MBA	86,800	198,000	10.0
PhD	98,200	300,000	6.0
MOBILITY**			
Have changed jobs	$77,900	$160,000	14.5
Have not changed jobs	76,700	300,000	7.9
MOST IMPORTANT JOB FUNCTION			
Add value by leveraging IT	$87,500	$300,000	10.6
Create IS architecture	78,500	125,000	9.3
Update obsolete systems	65,000	95,000	10.0

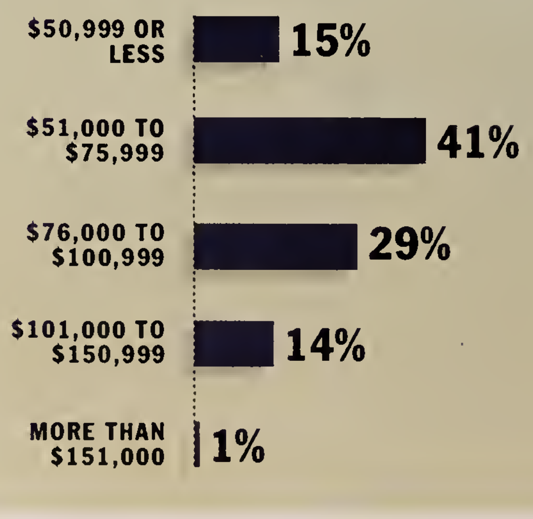
*Self-reported average annual increase in salary over the past two years

**Mobile executives are those who indicate they have changed jobs or been promoted over the past two years.

NEARLY ONE-THIRD of IS directors and managers are affiliated with divisional or line units, whereas only 17 percent of vice presidents report outside corporate headquarters. Average salaries do not suffer for divisional IS directors, who make $83,000—nearly $7,000 more than the $76,100 earned by corporate IS directors.

SALARY PERCENTILES

Percentage of Directors or Managers Who Made the Following Salaries



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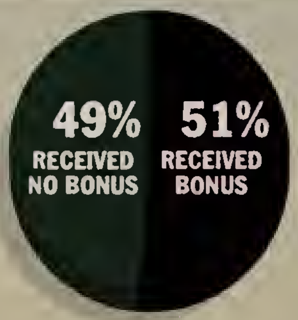

26% RECEIVED A 1% TO 5% BONUS ON AN AVERAGE SALARY OF $72,300

33% RECEIVED A 6% TO 10% BONUS ON AN AVERAGE SALARY OF $78,000

33% RECEIVED AN 11% TO 25% BONUS ON AN AVERAGE SALARY OF $103,900

DIRECTOR FACT: Corporate IS directors in health care make an average $66,500, but divisional directors make $124,900.

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HOW I.S. EXECUTIVES' FUNCTIONAL CONCERNS AFFECT COMPENSATION

RANK/MOST IMPORTANT FUNCTION	NUMBER OF RESPONDENTS	% SALARY PREMIUM*	AVERAGE SALARY	HIGH SALARY	PERCENTAGE INCREASE**
1. Add value by leveraging IT	163	19.2	$116,700	$440,000	11.4
2. Enable change and speed	72	14.5	112,100	600,000	15.5
3. Align IS with corporate goals	220	10.9	108,600	850,000	11.1
4. Create an IS architecture	50	-8.7	89,400	260,000	9.8
5. Make IS cross-functional	81	-8.9	89,200	250,000	8.9
6. Do business reengineering	43	-11.1	87,000	188,000	9.7
7. Connect to customers, suppliers	31	-14.8	83,400	205,000	6.3
8. Improve product development	33	-17.0	81,300	200,000	13.3
9. Update obsolete systems	56	-17.0	81,300	200,000	9.1
10. Organize and utilize data	51	-17.6	80,700	650,000	9.2
11. Improve IS human resources	6	-26.1	72,300	115,000	8.0

*Percentage that average salary by function is above (or below) the overall average salary for all functions combined

**Self-reported average annual increase in salary over the past two years

WHEN ASKED to identify their most important job function, 220 executives, or 23 percent of the sample, said aligning IS with corporate goals is the most important thing they do. Another 163, or 17 percent of the sample, said adding value by leveraging IT. Good answer! Executives who checked these functions earned significant salary premiums above the average IS executive.

WHEN I.S. EXECUTIVE COMPENSATION IS MAXIMIZED

MOST IMPORTANT FUNCTION BY SELECTED INDUSTRIES	% SALARY PREMIUM
ENABLING SPEED AND CHANGE	
High-tech manufacturing	156
Other manufacturing	61
ALIGNING IS WITH CORPORATE GOALS	
Communications services	59
Other business services	30
Utilities	17
ADDING VALUE BY LEVERAGING IT	
Wholesale and retail trade	46
Health care	40
Government	23
Finance, insurance, real estate	14
CONNECT TO CUSTOMERS AND SUPPLIERS	
Computer services, software	29

BUT IT SEEMS that executives who focus on particular functions that meet their industries' special needs make the best bucks.

Manufacturing industry executives, for example, pull down salary premiums of between 61 percent and 156 percent by focusing on projects that enable corporate speed.

Computer software and services executives make more money by focusing on projects that connect the company to customers and suppliers.

HOW INDUSTRIES STACK UP IN THE I.S. EXECUTIVE COMPENSATION GAME

RANK/INDUSTRY	NUMBER OF RESPONDENTS	AVERAGE SALARY	HIGH SALARY	% INCREASE*	% SHARE W/BONUS	SIZE BONUS**
1. High-tech manufacturing	46	$124,200	$600,000	12.0	67	26.6
2. Communications services	39	115,800	850,000	12.4	59	21.8
3. VAR, VAD, systems integration	16	112,700	250,000	12.2	69	15.7
4. Construction, agriculture	18	112,400	317,000	9.4	61	22.1
5. Finance, insurance, real estate	167	111,400	650,000	11.7	80	18.8
6. Other business services	53	110,500	400,000	16.0	62	20.9
7. Utilities (telecom, gas, etc.)	40	103,600	250,000	14.3	65	15.2
8. Wholesale, retail trade	99	103,500	440,000	10.9	63	21.4
9. Computer services, software	41	97,600	200,000	9.7	71	14.5
10. Health care	100	97,000	315,000	8.8	48	13.7
11. Manufacturing (not high-tech)	122	92,100	334,000	10.6	70	16.8
12. Transportation services	21	90,300	210,000	14.6	67	23.5
13. Accounting, legal services	8	74,000	156,000	15.9	50	10.2
14. Military	13	71,700	99,000	8.8	31	6.5
15. Education	52	69,200	120,000	8.2	17	32.3
16. Government	108	67,800	142,000	6.2	19	4.4

*Self-reported average annual increase in salary over the past two years

**Bonus columns are (1) percent share of respondents who got a bonus over the past two years and (2) the average size of bonus as a percent of average base salary.

ABOUT THE CIO EXECUTIVE COMPENSATION SURVEY

CIO MAGAZINE MAILED 5,000 SURVEYS to CIOs and other information systems executives in September 1995. By Oct. 31, we had received 957 usable surveys for tabulation. We received another 58 usable surveys after the cutoff date, bringing the total response to 1,015, but these were not included in the official tallies.

By title, 14 percent of the sample are chief information officers (CIOs); 2 percent are chief technology officers (CTOs); 22 percent are vice presidents of information systems, management information systems or data processing; 49 percent are directors or managers of IS/MIS/DP; 6 percent are vice presidents, directors or managers of voice/data networking/communications; and 6 percent have other, miscellaneous IS titles.

Special thanks to Debbie and Lloyd Simon at Analytical Computer Services Inc. in Waltham, Mass., for tabulating the voluminous survey results; and to Carol Spach, vice president of circulation at CIO Communications, for organizing the mailing.

HOW TO ORDER THE FULL SURVEY RESULTS

BECAUSE OF THE HIGH RESPONSE RATE to our executive compensation survey, every region of the country, every industry and every job function was well-represented. That allowed us to cross-tabulate a variety of data in order to explore the significant correlations between salary levels and education, age, experience, size of company, budgets and other factors. The summary of the survey results presented here touches on only a portion of the data. *CIO* readers may want to consider exploring the salary yardsticks in more detail in order to benchmark against individual experiences and backgrounds and to help manage salary evaluations.

You can order your own complete 1996 *CIO* Executive Compensation Survey results, which total more than 400 pages of data, for $795. For additional information, please contact Lisa Kerber, editorial administrative assistant, at 508 935-4449, or via e-mail at *kerber@cio.com.*

The standards by which CIOs are judged are rapidly shifting—and getting tougher

Sitting in the HOT SEAT

BY CHRISTOPHER KOCH

HOW DO YOU MEASURE UP?

JOHN GLASER, VICE PRESIDENT AND CIO OF Partners HealthCare System Inc. in Boston, barely remembers his last performance review. "I think it lasted 10 minutes," he recalls hazily. The review might not have happened at all, he adds, if the human resources department hadn't sent out a reminder. And when he finally did sit down with his boss, he had no clear idea what official measures formed the basis for the coffee-break-length encounter.

How does Glaser describe this boss, who has since moved elsewhere within the organization? "He's terrific," Glaser says.

Most employees would offer a less printable response in this situation, but for Glaser and the boss in question, the meeting had a meaning different from what one might assume. The brusque, anticlimactic atmosphere was a function of redundancy, not neglect. The review just capped a year's worth of communication about the most important issues affecting the business. Indeed, by the time Glaser and his boss, Jay Pieper, vice president for corporate development and treasury affairs, sat down to discuss Glaser's scheduled merit raise, they were pretty much talked out. It was a reminder that within Partners HealthCare, Glaser had arrived: As CIO, he was among the company's most valuable senior executives, and the fact that Pieper had nothing to say confirmed that Glaser was doing his job quite well.

According to many experts, Glaser's evaluation confirms a trend at many successful companies these days: The CIO has become too important for meetings like this.

As more CIOs belly up to the executive committee table, traditional evaluation measures like downtime and systems delivery are being augmented by performance measures that are difficult to quantify anywhere but in the minds of the others sitting in the executive suite. "In a sense, every discussion is an evaluation," Glaser says. "When you're meeting with other senior executives, someone is forming conclusions about you on the other side of the table every minute, whether you like it or not."

So with the CIO's relatively new, unprecedented access to the business comes a risk—a great risk for IS traditionalists accustomed to remaining mysterious and aloof from the business. In addition to an indispensible technological savvy, CIOs are now expected to possess exceptional people skills, political prowess, a broad business view and change management skills. Who they are is now as important as what they do.

"The CIO today needs to be, number one, a politician and, number two, someone who can deliver," says Michael J. Earl, professor of information management and deputy principal of academic planning and resources at London Business School. "That's a rare combination. How many politicians do you know who can actually deliver?"

Even in companies where the CIO isn't invited

PHOTO BY JAY REED

JOHN GLASER: *Once CIOs become part of the executive elite, every discussion is an evaluation.*

CHRIS COURNOYER: *Saving money for the company is no longer enough to justify IS initiatives. CIOs must also advance the cause of the business.*

PHOTO BY WEBB CHAPPELL

to executive committee meetings, it's clear that he or she at least needs to buttonhole the key members afterward. Without direct communication between top-level executives and the CIO, the IS function is more likely to be viewed as a cost than as an asset, according to a 1994 study of CIOs in 60 organizations by Michael J. Earl and David Feeny, director of the Oxford Institute of Information Management at Oxford University's Templeton College.

"We found no evidence that a CIO higher up on the organizational chart performed better than one lower down, but we did find that all the successful CIOs found a way to build relationships with the top-level executives," Earl says. If the CIO doesn't actively participate in the senior executive decision making of the company, he or she won't understand what really matters to the business and won't be able to suggest ways IT can contribute, according to Earl. Elevating the role of the CIO within the company is no guarantee of success, but it at least ensures easier access to important conversations.

ASK PIEPER OR ANY OTHER senior manager to list the specific metrics that describe the successful CIO "influencer," and they'll be hard pressed to do so in brief, line-item terms. What emerges instead from the CIO evaluation process these days—beyond the demanding operational responsibilities of keeping the network running and new applications flowing—are broader, more subjective areas of concern. Most important of these is deepening the executive relationships with the business side. These slightly Machiavellian re-

Doing it By the Numbers

Evaluation software helps manage mammoth review task

Evaluating the job performance of top-level executives can be time-consuming and draining, especially if many opinions must be considered. An increasing number of companies are streamlining the appraisal process with performance evaluation software customized to reflect appropriate criteria and the organization's review philosophy.

While it was never intended to replace face-to-face communication between executives and their supervisors, performance evaluation software can be helpful to supervisors who balk at initiating an appraisal.

"Our president dreaded evaluations every year because it was such a laborious process," says Nancy Calonius, manager of human resources for Orlando, Fla.-based Integrated Pharmacy Solutions Inc. In 1994, Calonius suggested that he try using KnowledgePoint's Performance Now, and soon the president was churning through evaluations at a speedy clip, she says.

Using the software, managers numerically rate an employee's skills, and the program translates the rating into narrative form. The program's consistent, descriptive language provides a starting place for managers who have trouble beginning the process and helps employees better understand the perceptions of a reticent or inarticulate boss, says Diane Pratt, a spokeswoman for KnowlegePoint in Petaluma, Calif. When the manager tweaks the sentences, the software flags any subjective wording introduced and suggests ways to rephrase. Avantos Performance Systems Inc. also makes a report-generating product called Review Writer 3.0, which offers a structured process for setting up and writing reviews. The program also provides expert advice on effective review writing and makes content suggestions.

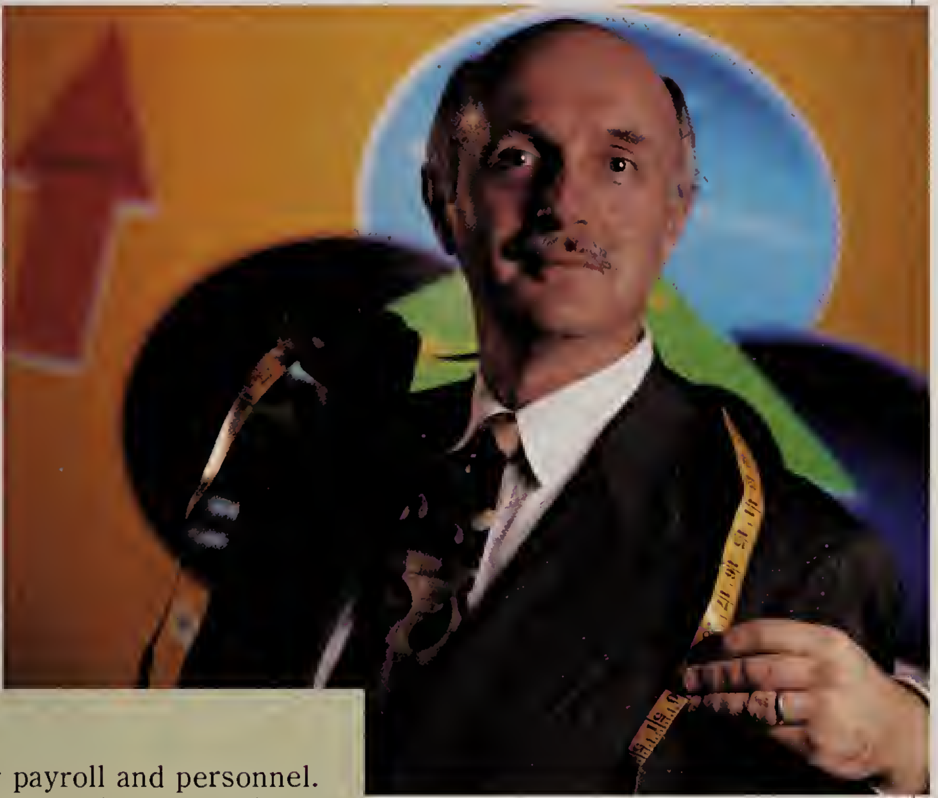
Another problem with executive reviews is that the evaluator is often not familiar with the individual's daylationships form the means to achieve the desired ends, such as securing IT investment and influencing perceptions about IT's contribution to the business.

According to E.P. Rogers, CIO of Mutual of New York, a life insurance company, the traditional IS executive expected that trust could be built solely on competence—the ability to get the technology job done. Yet, today, the CIO must project business-focused integrity and honesty as well to build a sense among business counterparts that the CIO is loyal to the company as well as to the IS function. "If those two pieces aren't together," says Rogers, "the business can't trust you, and if the business can't trust you, it can't have a relationship with you."

Glaser says certain "intangibles" affect whether businesspeople view the CIO as someone they can trust and respect. "Does this person work well with the team?" asks Glaser. "Can he or she do a good job helping everyone understand what client/server really is? Can he or she mix well with the board? Is the CEO proud to have him or her be a part of the team that represents the company? There are a whole bunch of decorum and personal characteristics that you'd want to see in any executive that you should see in the CIO also."

Being considered part of the business means the CIO can better deal with the Catch-22 of managing expectations in an environment where strategic objectives aren't always clearly articulated. According to Pieper, the CIO who networks well with the business can avoid the grief of misguided messages by discovering the critical work processes that govern the company. "You start thinking, 'If the people in the front office don't know what they want 12 months from now, how can I know?'" he asks. "The answer is, you can't. But every business has a handful of people who know what the basic work of the company is. If you find them, you know what most of the business problems are. Those are the foundation blocks for working on things that allow you to go in any direction management decides you should go."

Implicit in that assessment of the work of the company is an ability to recognize when that core focus is absent—when IS is merely serving the demands of constituencies rather than the business itself. To deal with that issue, Jeff Hartigan, CIO of Inacom Corp., an information services provider in Omaha, Neb., uses what he calls "constructive impedance." "There's no sense creating expectation that there's no opportunity to deliver against," he says. "If I'm effective, you'll hear noise from my peers that says, 'Jeff isn't always 100 percent behind what I do. But when he says he isn't, he'll listen to [me] and explain what he thinks should happen and try to find some constructive



JEFF HARTIGAN *uses "constructive impedance" to manage expectations rather than rushing to fulfill every request executives make.*

PHOTO BY GREG GILLIS

to-day activities. Yet consulting everyone in the organization poses an administrative nightmare for larger companies. Evaluators can use 360-degree feedback software to gather observations from many individuals and departments. The program can be placed on a company's network, where employees can offer input at their convenience. Their contributions are centralized in one file for review by the evaluator and executive being reviewed.

"The theory [with this software] is that someone who just kisses their manager's ass doesn't always end up looking good when in essence they're not managing the load," explains Row Henson, director of product strategy for PeopleSoft, Inc., a Walnut Grove, Calif.-based company that makes human resources managment systems for payroll and personnel. "It's based on trying to motivate more of a team-based environment."

Such feedback products include Seris Applications Inc.'s Multi-Focus Review and Avantos' Avantos AMS/3.

Marc Blessing, vice president of corporate development at the national search and recruitment company, Management Recruiters International, and a proponent of performance evaluation software, cautions against relying solely on the software. "These tools are not the entire answer," he says. "Don't believe in fairy dust. There's no assessment vehicle that's the end all, be all."

But for companies looking to revamp the way they assess job performance, evaluation software might be a good place to start.

–Jennifer Bresnahan

Five Ways My Company Can Help Your Company Make Better Business Decisions

The best way to improve decision making is to start with good information. Complete. Accurate. Current. And available to everyone who needs it—when they need it.

Turning corporate data into real business information, and delivering it to the right people at the right time, is our business.

We've been doing it for almost 20 years for many of the world's most successful companies. And we can do it for you. Here's how:

Dr. James H. Goodnight
President, SAS Institute Inc.

1

Data Warehousing There's no better way to stage the data used in decision making. Put it where people can get to it without a lot of nonsense—and away from your on-line transaction processing systems. Your decision makers will get consistent and up-to-date data they can use—without dragging down the performance of your operational systems. Whether you need a complete end-to-end solution for data warehousing, a piece here or there, or just some good advice, we can help.

2

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3

Technical and Analytical Tools Of course, decision making is not unique to the business side. If you have quality issues on the shop floor or need to analyze the results of your market research, we can deliver the industry's richest set of tools for handling virtually any analytical need.

4

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5

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ways to deal with the problem.'

"If you're in a corporate culture that says the only way the CIO will be measured is by the happy meter," adds Hartigan, "that CIO is probably going to be very ineffective in terms of helping the bottom line of the business. He or she will become a slave and will become mired in trying to keep everyone happy, and it won't happen." Indeed, in Earl and Feeny's study of CIOs, those who were successful focused the IS agenda on a few projects that had strategic importance to the business rather than scattering the portfolio around the company.

This kind of planning also gives the CIO an opportunity to build senior management's IS expectations on the specific challenges and constraints the department faces, rather than on media accounts of the latest trendy products and ideas, says Glaser. "Often, businesspeople will read about some new system that another company has implemented and wonder why we haven't done it. It immediately becomes a failure in their eyes. You have to read what they read so you're ready to respond. Then you can say, 'Yes we can do that, but we have to devote this amount of organizational resources and time to do it.'"

THE INCREASINGLY BILATERAL negotiations that surround IS projects almost establish clear expectations for a CIO by default. Hartigan's boss, Inacom CEO Bill Fairfield, says he spends little time setting measures for Hartigan because Hartigan sets most of them himself. "Working with the business to define the value for any particular project establishes the measure right upfront because of the kinds of questions that Jeff and his people will ask," he says. Hartigan doesn't just explain what IT resources will be required for the project; he tries to get the business to explain what bottom-line impact the project is expected to have, given the IS investment.

Hartigan looks at these meetings with a business mindset, which means the discussion often takes place on a golf course, or in a bar or restaurant. "I make sure I do something at a personal level with at least one of my peers in the business once a week," Hartigan says. "It builds relationship capital that I can call on when things get testy be-

E.P. ROGERS: *The business needs to feel that the CIO is loyal to the company as well as the IS function.*

PHOTO BY FOREST MCMULLIN

The Shadow Knows

Consultant coaches offer pointers for developing leadership skills

If a CIO works with a technology-skeptical CEO, there may be ways to shift the perception. Sometimes, the root of the skepticism is simply personal: The CEO doesn't value IS because the IS director thinks and acts like a manager, not a business leader. John Glaser, vice president and CIO of Partners HealthCare System Inc. in Boston, asks pointedly: "If you aren't at the strategic table, did you, when you had the chance, display the characteristics that would make the CEO think it's worthwhile to have you there?"

If such business skills and leadership characteristics are present but not evident, some coaching may help. One of the more popular areas of consulting these days is known as "shadow coaching," in which an executive is observed in a variety of situations to determine how he or she deals with employees and peers. The consultant and the executive then meet on a regular basis to work on weaknesses and augment strengths.

"The shadow coach can see things that you might not observe in yourself," says Peta Penson, principal of enterprise development consulting for Co-Development International in Saratoga, Calif. "It may be that you're reluctant to let a team have its own self-direction, or you'd rather tangle with someone in a meeting than step back and try to find out why this question keeps coming up," she adds.

If spending valuable time on something like shadow coaching seems frivolous, that attitude might be part of the problem, too. CIOs are no longer judged by the hands-on work they do but by the relationships they build.

"The CIO of old, he's tough, he's brave, he stands alone—and he's kind of dead in the water in the '90s," says Penson.

–C. Koch

cause we have a lot of constructive conflict and confrontation here. Establishing an understanding of individuals and their likes and dislikes helps you work through the business situation because you know who those people are."

CIOs draw on the relationship capital account most heavily when they must assume the role of pulpit-thumping technology evangelist and secure money for major changes in infrastructure that may not have an immediate business impact. One of the signs of a successful CIO is the ability to obtain capital for projects beyond immediate needs, says Pieper. "Can he or she convince the organization to invest in fiber wire with four times the capacity that's needed today so that future needs can be met? At the senior level, many people's view of an area literally [determines how much money they vote to give it]."

If CIOs can't pull off the Billy Graham effect now and then, it may not matter how many efficiency reports they generate, according to some executives. IS can't merely be seen to be saving money; it must also advance the cause of the business. "If the businessman doesn't believe IS is contributing to the business, it doesn't matter how much money you show them you've saved," says Stu Kazin, senior vice president of worldwide operations and administration for Lotus Development Corp. Adds Lotus CIO and vice president of information services, Chris Cournoyer, "Very rarely have I said, 'We've saved this much money this year' and had anyone in the executive team remember it. It's the same for every function. Things move too fast, and everyone's trying to save money. By the time you say it, everyone's already expecting you to come up with new ways to save money."

Perception, then, has every bit as much to do with the CIO's contribution to the business as reality. And even the most effective CIO cannot thrive without the support of the CEO. "If the CEO creates a negative climate around IT, then it's going to be very hard for the IS director to do much of anything," says Earl. "But if the CEO states publicly that IT is important and suggests ways it should be leveraged, this helps the CIO in building relationships with the people that matter and helps him or her get invited to the meetings that matter. The CEO has legitimized both the CIO and IT."

That legitimization seems not to apply yet for those who come to the CIO role from another function outside IS. All the successful CIOs in Earl and Feeny's research came from IS backgrounds, and most never had a job outside the function. "It is those who are transplanted from other areas of the business who have struggled, uncomfortable with the technology, unclear of their careers, typically equipped to operate as forceful managers rather than as bridge builders and facilitators," they wrote in an article for the *Sloan Management Review* in 1994.

Aside from the growing need for a CIO to skillfully address issues of missions, perceptions and power bases, however, there is still something in the evaluation process that remains ubiquitous and unchanging: the need for a good boss. "I've had good evaluations, but we've had less-than-stellar years," says Glaser. "Initiatives head south, they get delayed, the business changes its mind, all kinds of things happen. Every executive has crappy years, and the question is—did they deal with those well?

"One of Jay [Pieper]'s pearls to me was, 'People are less worried about how you got here. They do want to know that you have a plan to get out.'"

Christopher Koch can be reached at ckoch@cio.com.

Taming the Tempest

'Mini-CIOs' can share the IS responsibilities

Beneath the CIO's growing strategic responsibilities lies a roiling tempest of day-to-day responsibilities known as operations. "No other senior executive has the same visibility in operations as the CIO," says Michael J. Earl, professor of information management and deputy principal of academic planning and resources at London Business School. "If the network goes down, people still blame the CIO. But if something goes wrong in HR or marketing, it's not necessarily the VP's fault."

Managing such overwhelming expectations at all levels of the business requires help. It is assumed that a CIO in a large organization will have trusted lieutenants to help run the day-to-day operations because so much of what the CIO does is moving outside of IS. Some of these lieutenants not only should be good managers and "doers," but they should have consulting skills so that they can become trusted spin doctors for IS with the various units of the business, says Gene Raphaelian, vice president and research director at Gartner Group Inc. in Stamford, Conn.

"CIOs need to have people who have business knowledge, leadership skills and technology skills—almost mini-CIOs—located with the clients," says Raphaelian, who works in Gartner's Industry Service branch. Besides schmoozing up the business, the consulting relationship leads to greater reuse of IT resources and "one-stop shopping" for business leaders, he says. "It reduces backlog on IT projects because the business knows where to go any time to get advice and prioritize projects." Having trusted lieutenants in the field also means CIOs can more easily seek out and sign up qualified businesspeople to lead (and take some accountability for) important systems initiatives—a must in making sure IS projects aren't ignored by (and therefore jeopardized by) the business, experts say.

–C. Koch

PREPARING • FOR CHANGE •

Working on the Railroad

Compelled to elevate their customer service standards and reshape their competitive positions, railroads are investing rapidly in corporate and industrywide IT locomotives that they hope will pull them up the hills of change

BY MEGAN SANTOSUS

Bill, owner and namesake of Bill's Furniture, wipes his brow as the Phoenix sun beats down on the first afternoon of May 2000. He watches as the Consolidated SouthWestern freight train pulls away on schedule with two boxcars loaded with his best end tables and armoires.

The cars will travel together only as far as the regional railhead in Houston. At that point, the shipment will be divvied up for an intermodal journey—some containers will move to truck beds, some to barges, and others will continue on the tracks of another railroad. The thought triggers a twinge of anxiety for Bill, especially now that he's adopted a just-in-time

THUMBNAIL

Industry: U.S. freight railroads

Primary Service: Freight transportation

Industry Revenues: Approximately $34 billion in 1994

Number of Players: 10 Class I carriers (more than $255 million in revenues); 35 Class II carriers (between $21 million and $255 million); nearly 500 Class III carriers (less than $21 million).

SOURCE: ASSOCIATION OF AMERICAN RAILROADS

FORCES OF CHANGE

Improved Profitability: Since 1980, rail companies have improved their profit margins through increased productivity and grown their market share to nearly 40 percent of ton-miles.

Impact: With rising profits, freight companies are operating from a position of strength. Carriers that were struggling to survive a few years ago are investing in infrastructure improvements, including information technology and new locomotives. Large carriers are merging and acquiring smaller lines.

Customer requirements: Shippers are demanding more reliable service to help them in their efforts to reduce inventory costs, adopt just-in-time manufacturing and better manage their supply chains.

Impact: Carriers have to provide scheduled service, shipment tracking and pricing options.

Competition: The transportation market is increasingly ruled by time-based competition. Price is less of a factor than convenience, reliability and flexibility. The main threat to the railroads are trucking companies that historically have lower rates, better reliability and more flexible service.

Impact: Rail carriers are making alliances with competitors in the trucking, air and sea sectors to provide seamless, point-to-point transportation services. Because of increased interfacing with other transportation concerns, rail companies have to improve capacity management and asset utilization in order to get the most efficient use of rail cars, locomotives and track.

ILLUSTRATIONS BY JAMES YANG

I.S. ACTIONS

Developing simulation applications and expert systems to help improve forecasting and capacity-management planning

Partnering with other transportation companies' IS departments to establish interfaces that facilitate sharing information such as intermodal billing data

Providing flexible and scaleable systems by migrating development from mainframe-based legacy systems to client/server technology to support rapidly changing customer needs

Consolidating and integrating systems following mergers or acquisitions

Examining new ways to provide customers with timely and accurate shipping and service information, including shipment scheduling and tracking systems

system. But he needn't worry. Last month, when floods wiped out four miles of track, SouthWestern sent hourly alerts via e-mail to notify him that his freight had been rerouted or transferred to other rail and trucking carriers for on-time arrival. If things get hairy again, Bill can now check shipment status himself by using the new PC-based tracking software SouthWestern just installed for him.

> *"We have to be totally committed to customer service now because if we're a few days late, we can shut down an entire plant."*
>
> –CHARLES FELD

Five years from now, this idealized account of an efficient, reliable and proactive rail operation may be very close to reality—a reality that customer demand and competition are shaping and that information systems departments will enable. Shippers (customers) that adopt just-in-time manufacturing or strive to reduce cycle times need flexible and reliable transportation services. Historically, freight trains operated haphazardly; service began when shippers arrived at the yard and cars were loaded. Today, offering scheduled service along the lines of airlines and passenger trains has become a major competitive priority.

"Our customers don't keep 10 weeks' worth of inventory anymore," says Charles S. Feld, senior vice president and CIO at Burlington Northern Santa Fe Corp. (BNSF). "We have to be totally committed to customer service now because, if we're a few days late, we can shut down an entire plant."

Yet the seemingly simple act of maintaining schedules creates new demands on carriers and their IS departments. For starters, they need to cultivate the ability to keep close tabs on shipments and resources such as cars, locomotives and crews.

In addition, shippers don't want to be bothered making numerous phone calls to all the players involved in moving freight from point A to point B. "Our larger customers are looking for a single logistics provider," says John Andrews, senior vice president of technology for CSX Transportation Inc. in Jacksonville, Fla. It's a need rail carriers will have to address if they hope to capture more market share in the intermodal shipping arena, the fastest-growing segment of the transportation industry. Intermodal competition is intense, with trucking, air, sea and rail companies vying for billions of dollars' worth of business.

Thanks to a recent upturn in their fortunes, Class I carriers—the 10 rail companies with more than $255 million in annual revenues that control roughly 90 percent of the rail freight market—are in a position to act strategically. In 1994, revenues reached $31 billion, an increase of nearly 7 percent from the previous year, according to the Association of American Railroads (AAR) in Washington. Profit margins are up as well, even while rates have declined in real-dollar terms. The AAR also reports that rail's market share, which had been eroding since World War II, has edged up four points, to nearly 40 percent of ton-miles, since 1980. (Trucking owns about 28 percent of the freight market.) In the highly competitive auto market, for example, 70 percent of new vehicles are shipped by rail today compared

COMMON THREADS

IS executives in industries undergoing dramatic change should:

Look to other companies that have a reputation for using IT strategically. Many railroads, for example, seek to emulate companies such as Federal Express and UPS for their ability to provide customers with fast, accurate information about their shipments.

Form alliances with other companies within the industry. Rail carriers are being asked to provide seamless transportation services with the likes of trucking, sea and air carriers. By partnering with competitors, the transportation industry as a whole can benefit.

Stay close to the changing needs of customers. As shippers demand new types of services, rail carriers need to respond quickly. New technologies such as the Internet and World Wide Web can help keep in touch with customers, improving communications and providing insights into customer preferences.

with 40 percent in 1980.

As the headlines have attested, the railroads have leveraged their recent prosperity to embark on a wave of mergers and acquisitions. In 1995, Burlington Northern Inc. and Santa Fe Pacific Corp. joined to form BNSF, a Fort Worth, Texas, giant with $8 billion in revenues and 31,000 miles of track. A proposed merger between Union Pacific Railroad and Southern Pacific Rail Corp. is pending, with a decision expected this summer. Industry watchers predict this consolidation trend will continue over the next five years until only four or five Class I players remain. In 1980, there were 40 major railroads.

> *"As those needs change, carriers are trying to align themselves with other companies that can complement their operations."*
>
> –MIKE GELHAUSEN

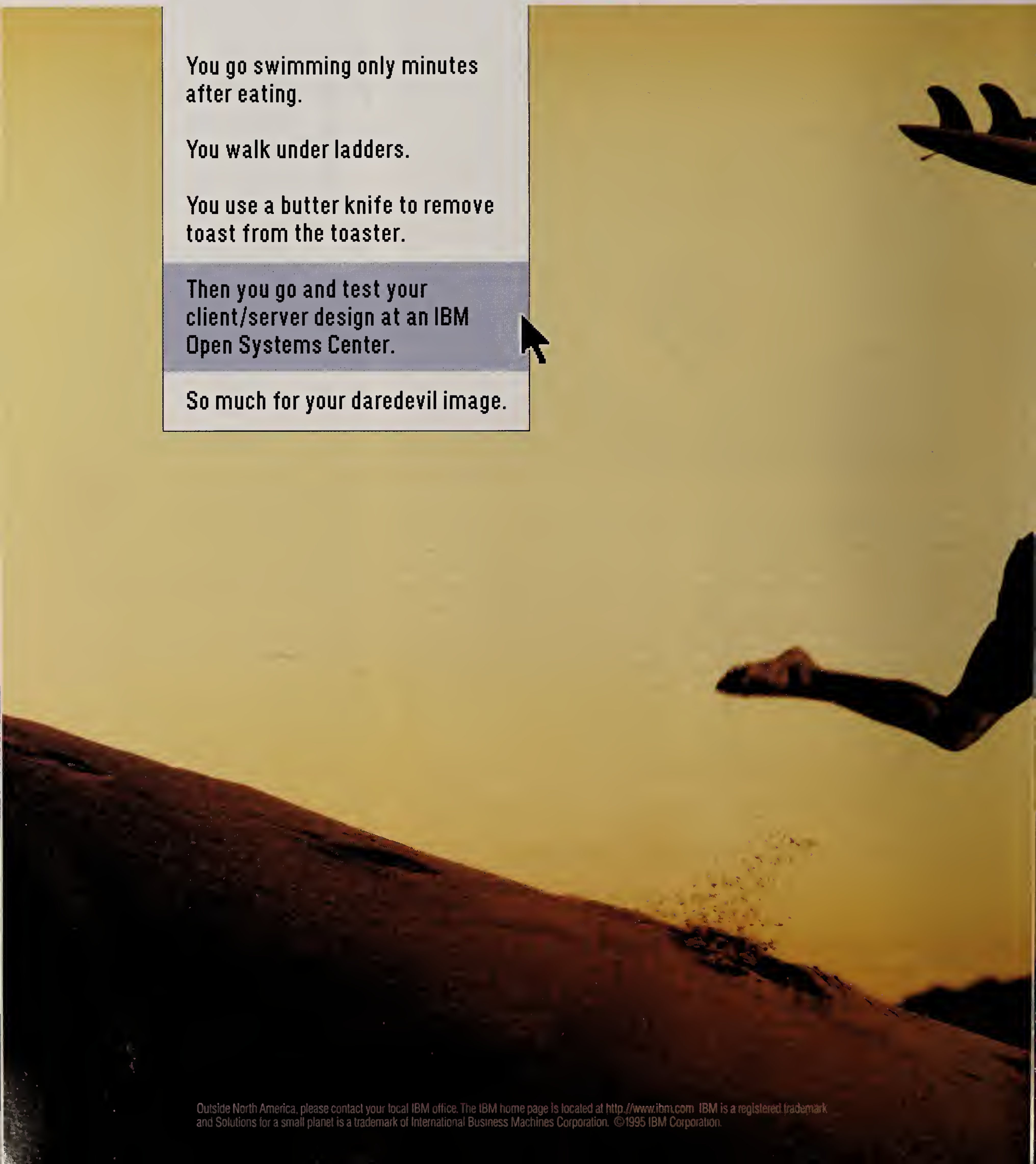
Why all the couplings? "In one sense, rail companies are looking to achieve economies of scale," says Mike Gelhausen, managing partner of the Transportation and Travel Services Practice at Andersen Consulting in Dallas. Merged companies require less overhead, typically resulting in downsized marketing and headquarters staff. But cost efficiencies are not the only reason for mergers, Gelhausen contends. "It's important for carriers to support the overall needs of their customers, the shippers," he says. "As those needs change, carriers are trying to align themselves with other companies that can complement their operations."

CIOs, too, recognize that the days of going it alone are over. "We're looking at how we can expand our territory," says CSX's Andrews. "To do that, the railroads are banding together to take market share away from our competitors."

To support these alignments and the other competitive- and customer-driven strategies, railroad IS departments and associations have been pursuing several initiatives: shipment and equipment-tracking systems, simulation and modeling technologies, and network integration with outside transportation companies. "We can't do anything without integration," says Wick Moorman, vice president of information technology at Norfolk Southern Corp. in Norfolk, Va. "We're very dependent on other companies because 60 percent of our freight is handed off or received from them." Industrywide, more than 30 percent of rail cars travel interline, or between two or more railroads.

Because of the amount of coordination required, the AAR, which represents the collective interests of most carriers, is taking the lead on industrywide initiatives designed to "make the railroads look like one seamless service provider," says Randy Randazzo, AAR's vice president of technology services. Development funding for projects—which will amount to more than $9.5 million in 1996—is provided by member carriers. (The AAR also charges members for processing services.) In addition to funding, members on occasion also lend some of their own IS personnel to augment AAR's 130-person IS staff.

AAR developed an automatic equipment identification system that helps rail companies track the location of specially equipped cars. Transponder-equipped cars reveal themselves to the system as they pass 1,500 readers installed alongside track throughout North America. Another AAR-developed system, Interline Service Management (ISM), enables allied carriers to electronically share schedule and customer in-



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formation to create a beginning-to-end trip plan for each shipment. When it's fully implemented, ISM's central mainframe database will track the daily car movements of all railroads, improving the reliability of interline schedules, according to Randazzo.

On-time shipment reliability rates have historically averaged only 60 percent, compared with trucking's 95 percent. In a recent ISM pilot, reliability surpassed 90 percent. Customers will be able to access this system and use the data to track their own shipments or obtain status reports on an ad hoc or scheduled basis.

Other key AAR projects include an industry-standard PC package that allows shippers to use one tool to communicate via e-mail and EDI with participating carriers. Currently, many carriers use their own communication packages, which are not compatible across companies. An integrated billing system, the Interline Settlement System (ISS), enables railroads to transfer waybill information and funds electronically so that customers receive a single bill for interline service. According to Moorman, ISS has reduced the average fee settlement period from three months to 30 days.

> *"The railroads are banding together to take market share away from our competitors."*
>
> –JOHN ANDREWS

For the AAR's projects to succeed, however, individual rail companies must have their own IS houses in order. Most are engineering new systems or making enhancements to outdated ones. At Union Pacific, migrating development to client/server environments is a priority, says Vice President of Information Technologies and CIO Joyce Wrenn, who is based in Omaha, Neb. "New client/server systems are scaleable, so they can change along with the business or customer needs," she notes. "They also provide our internal people with flexibility and ease of use." Union Pacific recently developed several Windows-based systems to provide employees with a view of operations. One system, for example, allows customer service reps to proactively monitor intermodal shipments and alert customers when trains fail to meet schedules.

CSX is also devoting a lot of attention to client/server-based customer service systems, according to Andrews. CSX's mainframe-based Transportation Workstation system consolidates and distributes customer data through a GUI-based front-end workstation. It was recently enhanced to permit online car and

RAILROAD INDUSTRY AT A GLANCE

PAST

Before the Staggers Act deregulated the transportation industry in 1980, the railroads were marked by inefficiency and factionalism. Shipments that moved among different carriers could spend as much time in a rail yard waiting for pickup as they spent traveling toward their destination. With competition firmly controlled by the Interstate Commerce Commission, customer service was a distant concern. In fact, many carriers operated trains based on their own convenience rather than their customers'. Shippers in need of reliable transportation services turned to trucks by the droves.

FUTURE

With competition fierce and customer service a priority, railroads consolidate and ally with rival transportation firms to offer seamless, convenient service. Freight moves from rail to truck to rail to barge without the customers' involvement. As reliability and precision aspire to Federal Express levels, railroads partner with shippers to form virtual supply chains in which raw materials are automatically replenished and inventory is maintained at predefined levels. Pricing is flexible and highly customizable to shippers' needs and preferences.

Logistical Concerns

Third-party agents enter the fray

As if competition among existing rivals isn't keen enough, rail carriers also have to contend with relatively new players in the transportation industry. Third-party logistics companies, which in effect serve as shippers' (customers') agents by handling all transportation arrangements, are also entering the fray.

The role of third-party logistics providers can be compared to that of travel agents in the airline industry. "They act as middlemen by coordinating the shipment of freight between shipper and carrier," says Mike Gelhausen, managing partner of the Transportation and Travel Services Practice at Andersen Consulting's Dallas office. "In this capacity, they can provide something of a funnel capability by bringing shippers together and consolidating access to carriers."

The rise of third-party logistics companies is driven from the shippers' end of the supply chain. Competitive advantage is increasingly derived from transporting goods to suppliers and customers quickly and cost-effectively, something a logistics agent can facilitate. This need will only grow keener as product cycles for everything from cereals to automobiles continue to shrink. Companies that produce customized products are also demanding highly efficient logistics services that third-party companies hope to provide.

Many rail carriers offer their own logistics services, often through subsidiary companies. But shippers may rightly wonder whether a railroad logistics agent would have enough knowledge or latitude to recommend alternative transportation options when appropriate. Increasingly, the mode by which goods arrive at their destination is not important; what counts is that they arrive on time and in good shape at the best possible price. Many shippers may opt for independent agents simply because they feel such companies can offer the most carrier options.

The jury is still out as to whether third-party companies pose a significant threat to rail companies. As carriers strive to offer more services in line with customer demands, many are looking to beef up their marketing efforts. Certainly, control of customers—and access to all relevant data—could become a point of contention among carriers and logistics companies. At the very least, the emergence of new players does highlight the need for rail carriers to conform to the requirements of a larger universe. "The logistics system has to be viewed as a whole rather than by its piecemeal components," says Bill Zollars, senior vice president of Ryder Dedicated Logistics Inc. in Miami, a third-party company that has experienced phenomenal growth in the past two years. Since customers are increasingly willing to pay for value-added services such as just-in-time delivery and end-to-end shipment tracking, he believes that "every provider has to do its part in an integrated environment." *–M. Santosus*

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locomotive reservations. In addition, CSX has rolled out client/server systems for its field sales force. The sales force needs such technology to seamlessly share customer pricing and service preferences with marketing back at the home office, says Andrews. This information sharing will help CSX create the customized service and price offerings that shippers increasingly expect.

At BNSF, IS has been busy integrating the systems of the two formerly separate companies, according to Feld. In 1995, a state-of-the-art network operations center began providing employees with a bird's-eye view of 23,000 miles of the merged companies' track. "The center is like air traffic control, where managers assign locomotives and crews and monitor schedules daily," says Feld. The benefit to BNSF is that managers can spot bottlenecks in the rail network and develop contingency plans to get around them.

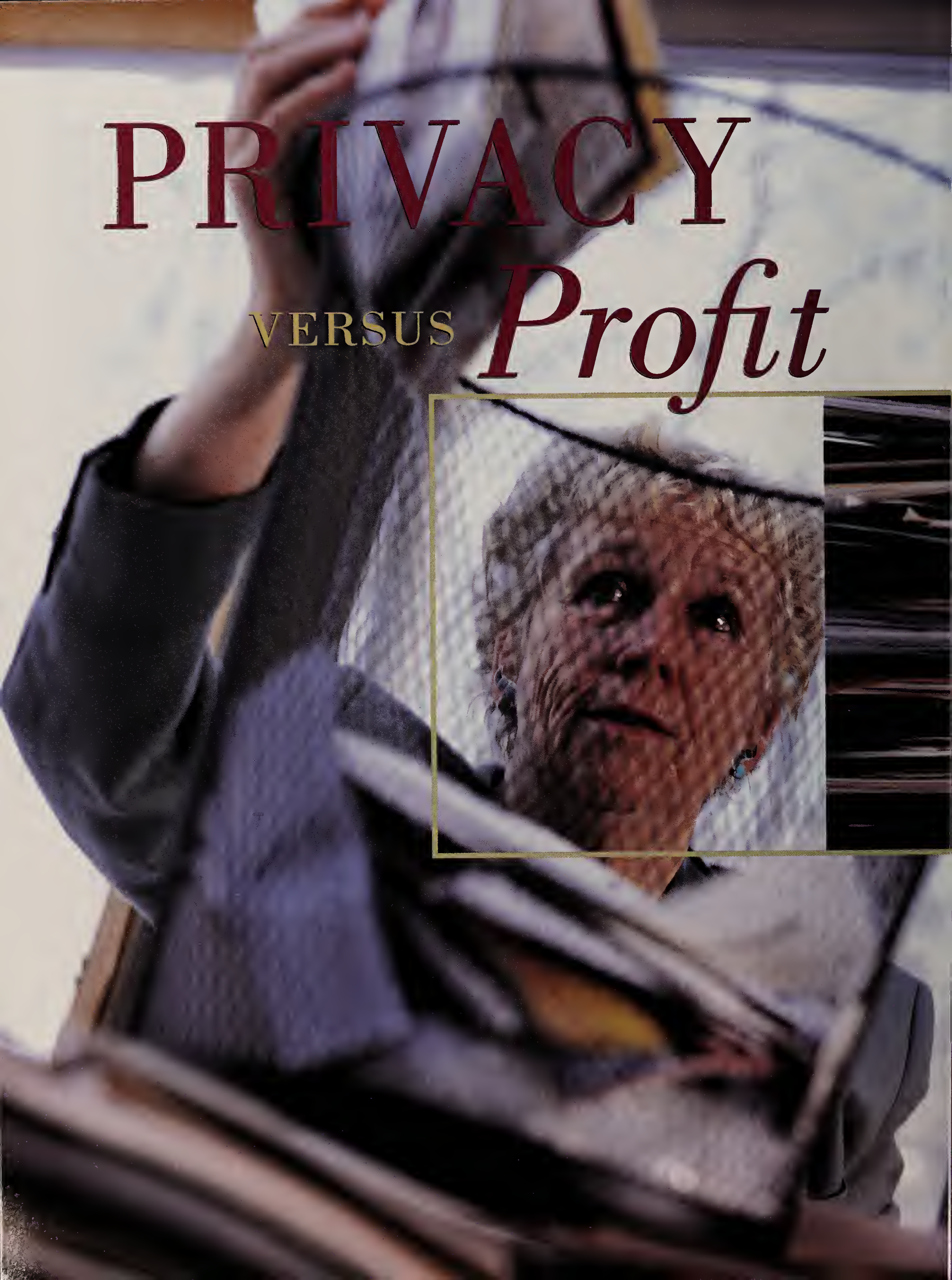
The ability to better manage assets such as routes, equipment and crews and react to weather conditions will help railroads meet customer demands for more reliable service. Norfolk Southern is using real data in simulations to more accurately forecast asset needs and predict the impact of any changes on the entire rail network. The railroad currently has the ability to simulate train movements; it is now developing supporting systems that feed in cost factors. The goal is to enable managers to "make service decisions that are not intuitively obvious," Moorman says.

Suppose, for example, that two trains per day operate between Norfolk and Atlanta. Using historical traffic data, managers will be able to accurately model the impact of adding four trains over the same line segments from both a financial and operational standpoint. "The traditional view is that it will be more expensive because we have to add more crews and perhaps locomotives," says Moorman. But if connections were improved and train speeds increased, such cost constraints could be mitigated.

In many cases, IS doesn't have to try too hard to sell these concepts to business managers. "From the CEO on down, people here believe that IT can take this company to the next level," Moorman says. At the very least, IT should make the trains run on time.

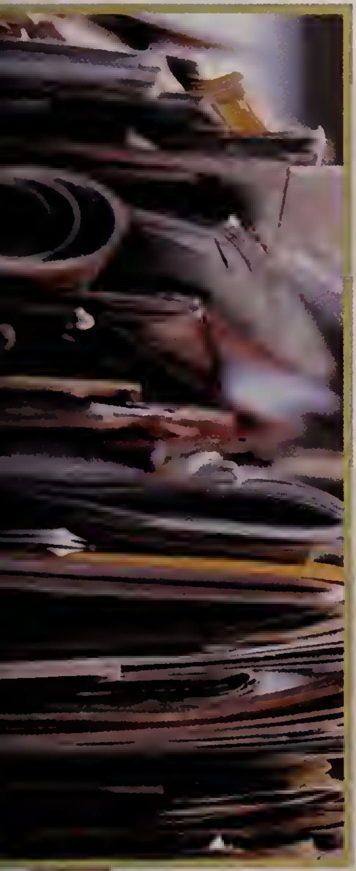
Megan Santosus can be reached at santosus@cio.com

PRIVACY VERSUS *Profit*



Who should own information? Communications and computer lawyer Anne Wells Branscomb advocates a legal infostructure that will strike the appropriate balance among business interests, the rights of individuals and the common good.

BY CAROL HILDEBRAND



Anne Wells Branscomb's interest in information ownership began, like charity, at home—courtesy of the U.S. Postal Service. Branscomb, a legal scholar-in-residence with Harvard University's Program on Information Resources Policy, says her growing concern over the "mountains of unwanted mail" filling her mailbox (not to mention those annoying telemarketers interrupting her dinner hour) made her face up to how little control she had over the distribution of her name, address and telephone number—all items one might be excused for thinking one owns. Instead, Branscomb realized that the looming Information Age, with its sophisticated technological innovations, meant that public- and private-sector groups could manipulate and profit from such supposedly personal nuggets of information. The result of her ponderings, *Who Owns Information?* (BasicBooks, New York, 1994), examines the turf wars—involving intellectual property, privacy concerns and First Amendment rights—waged among a variety of interests over who owns valuable data such as names, addresses, and shopping and medical records. Moreover, as a lawyer with a background in both information technology and communications, Branscomb brings to the discussion a fascinating perspective on the impending collision of IT, with its better, faster, now mentality, and a legal process that operates at near-Edwardian speed. Senior Writer Carol Hildebrand recently spoke with her about how the fallout from the legal fisticuffs will affect the course of technology and business in the Information Age.

CIO: *To paraphrase your book title, does anyone in fact "own" information? And how does technology play into this equation?*

BRANSCOMB: The advent of computers and the Information Age brings a new meaning to the term "owning information," and intellectual property law has not yet changed to reflect this. Currently, that which is original, such as a novel or an actor's performance, is "owned" by the originator or those to whom the originator has released control; that is what the intellectual property laws protect.

Computers and information-based businesses change that equation in several different ways. First, computer software is undoubtedly original creation and falls under intellectual property laws. But unlike, say, the performance of an actor, the software by its very nature is designed to behave in an identical manner whenever you use it. And since this makes software easy to copy, it's easier to violate copyright laws.

Secondly, many businesses are springing up whose main assets are not original information. Instead, these companies' worth is derived from unique organization and presentation of already existing material. Lexis-Nexis is an essential tool for lawyers to do their work, for example, as are medical databases essential tools for doctors and chemical databases for druggists. Large databases of historical weather patterns are improving weather predictions, and deter-

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mination of DNA sequences and genealogical patterns of illness is enhancing our ability to track and treat various medical conditions. Small businesses are able to survive and compete with larger firms through such practices as direct marketing, which involves the collection of personal information in large databases.

For these companies, it is more difficult to obtain legal protection of their intellectual property since the property is essentially the unique organization of previously existing facts rather than the creation of something new. Because much of the information listed in databases involves personal data such as names, addresses and phone numbers, the desire to exploit it for profit can collide with each individual's right to privacy. This is where we'll see some interesting legal precedents.

CIO: *Any recent examples?*

BRANSCOMB: It is rare that an individual takes sufficient interest or is willing to spend the time or money to litigate a concern individually, but one Ram Avrahami in Virginia has recently filed suit against *U.S. News & World Report* for selling his name to the Smithsonian Institution to solicit his subscription. He is suing under an old Virginia statute that prohibits the commercial exploitation of one's name or image without consent. The Electronic Privacy Information Center in Washington is filing an amicus brief, as is the Direct Marketing Association. This is a rare case but one that is creating a lot of interest and sympathy from others who might have liked to have filed such a suit but were unwilling to take the trouble.

It's important to note, however, that intellectual property law can be divided into numerous subsets such as audio, video and print information. For each of these categories, the rules may be quite different and complex. For such things as addresses, telephone numbers, images, medical records, purchasing habits, and religious and political preferences, little protection is available today.

Our original concern about computers was Big Brother. Now we're discovering that big business is the real Big Brother. Companies seem to know almost more about us than we know about ourselves.

CIO: *What about the interests of so-called "information broker" companies that profit from collecting and selling data such as mailing lists?*

BRANSCOMB: Those companies that organize rather than create information are the backbone of the Information Age, and as such they certainly should be protected from misappropriation of their work product by others who are "reaping without sowing." They have earned and deserve compensation for what they have produced that is useful.

CIO: *So who's winning the battle for ownership?*

BRANSCOMB: I think we're moving in the direction of giving more autonomy to individuals over disclosure of information about themselves as well as providing them with an opportunity to participate in the negotiation about how the information collected by others may be used. Many small businesses really depend upon telemarketing or direct mail to reach their customers, but these customers are becoming more vocal about how their names and addresses and various transactions and predilections are used. How we set the balance between the two sides is a very difficult proposition.

The question is, will the law hinder or help? The law can be a barrier to progress if it remains intransigent with respect to new opportunities. The legal process could facilitate migration to an information economy as we begin to see what "infostructure" will protect individuals who want more autonomy over their information profiles and offer opportunities for trusted intermediaries to use the information in a manner that benefits us as individuals and is not wasteful and costly. People will reveal a great deal about themselves to businesses that serve their self-interests.

At the same time, there is some information that should be widely distributed, and I think we will continue to have a lot of shared information. For example, if you have information about an epidemic, you want that widely distributed; or if a hurricane is coming, you don't want that information to go out only to those who can afford to pay. What it boils down to is that there are a lot of different types of information that need to be categorized as to what should be supported by public institutions and what can be supported more efficiently by private enterprise.

CIO: *It seems that we have a number of different interests—government, business, private citizens and the legal faction—all involved in the privacy issues that revolve around information ownership. What are the implications of the debate for society?*

BRANSCOMB: Historically, our original concern about computers was Big Brother—the government invading our lives and having too much knowledge about and control over what we're doing. Now we're discovering that big business is the real Big Brother. By using technology, companies seem to know almost more about us than we know about ourselves. One aspect of this manifests itself in intrusions on private space—people who call us at the dinner hour or mail that overwhelms our mailboxes and our landfills. Another is when companies use personal information [such as name and phone number] without the consent of the person who generated the data in the first place. Although we might consider these intrusions just a minor nuisance, it could grow into a major social problem. For example, if unregulated, collection of data about what prescription drugs one is buying might render it difficult to obtain needed insurance coverage. The main thing is, one individual can feel helpless to stop the onslaught of new technology, and we are only just beginning to address these concerns in the aggregate. There are a few organizations, such as The Electronic Privacy Information Center, that are starting to lobby on behalf of individuals in such issues.

On the other hand, some of the more responsible direct marketers are beginning to see that a proactive stance toward privacy issues can be good business. In fact, it's useful for someone that you trust to know something about your buying habits because then they send you things in which you have a true interest. The difference between junk mail and valuable information is whether it's something interesting to you personally. I think that the concept of one-to-one marketing not only addresses this, but it's a positive use of technology as opposed to taking our names and addresses and delivering them to the world through mailing list sales so that we lose control of our own information.

CIO: *At the rate technology is changing, do you think our legal structure will be able to keep up?*

BRANSCOMB: The legal profession itself is torn between favoring legislative enactment, which is faster but more prone to generalization, and favoring case-by-case litigation, which addresses specific issues but is very slow.

A lot of lawyers—and there is obviously some self-interest driving this—prefer the case-by-case method because every case is decided on the specific facts of that case. This is particularly relevant when it comes to copyright law because many things put into copyright law serve one type of distribution and do not work well in another environment. For example, one of the early Supreme Court cases on reprography [the reproduction and distribution of material] involved the National Library of Medicine making copies of medical research. It's naturally in the general interest of everybody to have medical information widely distributed, and the case really involved the library publishing journals containing research that was largely federally funded. However, it couldn't have been a worse set of facts to send up to the Supreme Court to try to get protection for proprietary rights for creators of information. This case offers a good example of how a judgment may be entirely appropriate for the particular set of facts involved but entirely inappropriate or inequitable to other parties if applied as a general rule of law.

Some of the more responsible direct marketers are beginning to see that a proactive stance toward privacy issues can be good business.

CIO: *And what about the legislative approach?*

BRANSCOMB: A good example of the legislative approach can be found in the European Economic Community (EEC). They put out proposals on certain laws, and each nation weighs in with an opinion. Based on these opinions, the EEC then passes a directive requiring every EEC member to pass a law conforming to this directive. (The EEC also has European privacy commissioners, whose job it is to be aware of collections of data and to monitor fair practices in data management.)

A lot of lawyers have pointed out that by enacting legislation early, we run the risk of writing bad law since we may not yet know enough about the legal issues. I'm not sure there is all that much difference between writing a law and then hearing cases to see how the law applies or taking a case-by-case strategy and trying to develop a common practice through the judicial system, which can take several decades—if a consensus emerges at all.

When it comes to privacy issues, it is possible, if enough people feel that their personal information is being massaged by too many computers without their consent, that Congress will pass a law or states will enact consumer legislation requiring companies to seek the consent of individuals before they market information about them.

CIO: *For that to happen, though, the concerned citizen needs to make more noise?*

BRANSCOMB: Right. Law is essentially a structure that reflects the societal norms of a culture. The laws evolve only as fast as public opinion demands or supports change. If private citizens want more ownership of information, it's their job to tell their elected representatives. Change still comes about through public outcry and concern.

Carol Hildebrand can be reached at cjh@cio.com.

Mightier Mites

As software and wireless communications improve, handheld computers of all types are becoming the more functional tool of choice for mobile workers

BY DENNIS LIVINGSTON

ILLUSTRATION BY VIRGINIA HALSTEAD

Like Rodney Dangerfield, handheld computers used by traveling professionals have faced a certain lack of respect. Initially hobbled by high prices, lack of compelling applications and skimpy communications features, these devices once seemed to many like little more than executive toys. While usage rates are still modest, white-collar handheld devices have become handier tools, thanks to falling prices, beefed-up wireless communications capabilities and the availability of software that can link to back-office corporate databases. At the same time, their industry-specific cousins, long established in blue-collar fields, are tapping many of the same technologies to maintain and strengthen their position in core vertical markets.

Handheld devices can be broadly described as palm-size, lightweight, battery-operated systems that rely primarily on some combination of touch screens, pen-based tools and keyboards for input. Such systems are also frequently capable of accessing and transmitting information over wire-line and wireless communications networks.

A rugged version of this hardware first appeared in the hands of field-service technicians, sales personnel, parcel transporters, inventory managers, retail store clerks and employees in other businesses that could realize bottom-line improvements by enabling mobile workers to collect and transfer task-related data from the field or while roaming their workspaces. The number of industry-specific handheld devices shipped in the predominantly North American market will rise from 250,000 in 1995 to 850,000 by the year 2000, according to Phillip Redman, analyst at the Yankee Group in Boston.

More recently, handheld devices have become available to traveling executives who need to manage their schedules, prepare financial reports or other documents, stay in touch via electronic mail, connect to fax and paging services, and access remote corporate databases. The Yankee Group labels all such horizontal-market, general-purpose platforms as personal digital assistants (PDAs) or Personal Intelligence Communicators (PICs). "Sales have been slower in this market than anticipated, but a new generation of devices should lead to increased acceptance over the next five years," says Redman. He estimates 250,000 devices shipped in the United States in 1995, and predicts that figure will jump to 3 million

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Handheld Computers and Related Application Products

A sampling of vendors and products

Handheld/portable computer or communicator

Apple Computer Inc.	408 996-1010	*MessagePad 120*
Bell Atlantic Mobile Systems Inc.	800 255-2355	*Cellular Digital Packet Data*
Digital Ocean Inc.	800 345-3474	*Tarpon*
Fujitsu Personal Systems Inc.	408 982-9500	*Stylistic 500*
Hewlett-Packard Co.	415 857-1501	*HP 200LX, HP OmniGo 100*
Motorola Inc. Wireless Data Group	800 894-7353	*Marco Wireless Communicator, Envoy Wireless Communicator*
Norand Corp.	800 452-2757	*PenKey 6000 Series*
Psion Inc.	508 371-0310	*Psion Series 3a, Workabout*
Sharp Electronics Corp.	201 529-8200	*Zaurus*
Sony Electronics Inc.	408 432-1600	*Magic Link PIC-2000*
Symbol Technologies Inc.	800 927-9626	*PPT 4100, PPT4600*
Telxon Corp.	216 867-3700	*PTC-1100 Series*
Zenith Data Systems	708 808-5000	*CruisePAD*

Wide area wireless communications service

Ardis Co.	708 913-1215	*Ardis*
RAM Mobile Data USA LP	908 602-5500	*RAM Mobile Data*

Wide area wireless PC card

Megaherz Corp.	800 527-8677	*AllPoints Wireless PC Card*

Middleware communications software

MobileWare Corp.	214 952-1200	*MobileWare*
Racotek Inc.	612 832-9800	*KeyWare*

SOURCE: GIGA INFORMATION GROUP INC.

by the year 2000, with an additional 3 million units in Europe and Asia.

Future business uses of handheld devices of all types are difficult to predict because of a number of marketing and technological factors. But analysts say no matter how the market evolves, it is destined to grow.

"General-purpose machines will become complementary tools for more individuals in the future because they offer the ability to keep in touch as needed and to access and store critical information in an extremely portable package," says Bill Ablondi, market analyst at Giga Information Group Inc. in Norwell, Mass.

New uses for PDAs

Professionals are already finding cost-effective, innovative uses for their PDAs. Jeffrey Goldman, a lawyer with offices in Los Angeles and San Francisco, uses his Apple Computer Inc. MessagePad while in court. For example, he once faxed a note to his law clerk asking her to send an e-mail message with details from a case his opponent had cited. Goldman received the eight-page text within minutes (while the other lawyer pontificated) and was able to prove that his opponent had misconstrued the case. "The MessagePad is my office on the road," says Goldman. "I use it in place of a laptop and legal pad to access online research services, contact clients and take deposition notes unobtrusively. In fact, I save about one and a half hours per deposition with the MessagePad since I don't need a secretary to retype and review my notes."

Some PDA vendors have redesigned their products to take advantage of opportunities in the more lucrative industrial market. For example, Apple has licensed the Newton 2.0 operating system to Digital Ocean Inc., which manufactures the Tarpon, a Newton-based wireless, rugged device powered by a rechargeable nickel metal hydride battery designed to operate for eight hours on one charge. Digital Ocean, in turn, is working with Harris Corp., Monsanto Co. and other companies to adapt Newton technology to their markets.

Some vendors also point out that PDAs need not match all the parameters of industrial devices to meet the conditions of certain vertical markets. "Wireless platforms are ambidextrous machines that can serve specific or general applications, depending on the software used," says Mil Ovan, director of business development at Motorola Inc.'s Wireless Data Group in Schaumburg, Ill.

For example, the Stamford, Conn.-based Software Corp. of America (SCA) has developed PowerBroker, a wireless multiple listing service (MLS) application that runs on notebooks and any DOS-based handheld device, such as Hewlett-Packard Co.'s HP 200LX. The product allows a real estate agent to enter the criteria most important to a client into the portable computer and transmit it to a server that stores information downloaded from an MLS database provider. The server sends back a summary of relevant listings in the area. "This enables a realtor to respond quickly if a client is not interested in the homes being shown instead of losing control of the sales situation," says Shirley Eis, SCA's president. "Information coming over this system is also more current than the MLS books usually provided to realtors every two weeks."

Technological Advances

The evolution of the market for these devices will be affected by software and hardware advances that are improving the performance of handheld devices of all types. Significant developments include the availability of integrated chip sets, memory-sensitive operating systems and lightweight, wireless PC radio cards.

Integrated, power-saving microprocessors are showing up in the current generation of handheld devices. For example, Norand Corp. has teamed with Advanced Micro Devices Inc. (AMD) to co-develop the AMD Élan Am386 SC300 processor. This device combines the processing capability of a 33MHz 386 CPU with direct support for bus, memory cards and controllers, power management and other features needed by mobile users—all in one chip. The integrated chip's compact form factor, in turn, enabled Norand to produce the PenKey 6100, a small, rugged, 22-ounce device offering DOS and Windows environments and multiple wireless options.

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Battery life is prolonged by the Élan chip in several ways. For instance, it is designed to slip into low-power mode when the device is not processing information. In addition, integrating controllers and other components on one chip reduces power consumption.

Vendors are developing operating systems that meet a handheld device's need to minimize memory use and enhance communications functions. Pen-based versions of Microsoft DOS and Windows are popular among industry-specific devices, whereas PDAs and PICs tend to use proprietary graphical operating systems optimized for memory management, personal information management, communications and other core features. For instance, Hewlett-Packard chose Geoworks' Geos operating system for its HP OmniGo 100 PDA because the system's small memory requirements enable it to work efficiently and quickly with low-cost, low-power hardware, according to Roy Breslawski, product marketing manager in Hewlett-Packard's Asia Pacific Personal Computer Division in Singapore.

General Magic Inc. emphasizes the communications-enabling capabilities of its Magic Cap operating system. Among other things, Magic Cap incorporates General Magic's Telescript technology, which allows users who subscribe to Telescript-based communications providers (such as AT&T Corp.'s PersonaLink Services) to customize agents that perform such tasks as screening, routing and delivering electronic messages. Motorola's Envoy Wireless Communicator and Sony Electronics Inc.'s Magic Link series of PICs use this system.

Networking Options

While local and wide area wireless communications capabilities are an important option for mobile workers, in some cases, an individual who can send information in daily batches may not need wireless capability. But wireless capability is critical when the traveling employee needs quick access to time-sensitive information or when transmitting information by phone may not be cost-effective or convenient.

> **"General-purpose machines will become complementary tools for more individuals because they offer the ability to keep in touch in an extremely portable package."**
>
> *–Bill Ablondi*

Both local and, more recently, wide area wireless networks have benefited from the development of small, relatively lightweight PC radio cards based on the Type II PCMCIA form factor. Many handheld devices and other portable computers have slots that can accommodate such cards, obviating the need to attach bulkier devices for accessing networks.

The American Stock Exchange, for example, is undertaking a project that will enable options brokers to make buy and sell decisions and execute trades using Symbol Technologies Inc.'s PPT 4100 handheld devices, which incorporate Type II PCMCIA radio cards. The 4100s communicate with each other and central computers via Symbol's Spectrum24, a distributed-antenna, wide-band radio frequency system linked to the exchange's Ethernet LAN. This system will replace the hand signals, slips of paper and telephone calls that brokers customarily use to trade with each other. The change will also streamline the transaction process, says Omer Soykan, managing director of technology planning at the exchange. "Real-time comparison and reconciliation of any differences in the figures involved in executed trades can take place, something that now occurs long after a trade is made," he says.

In the wide area wireless sector, Megaherz Corp. in Salt Lake City has developed the AllPoints Wireless PC Card, which operates for about 30 hours on its nickel cadmium battery and is bundled with software from RadioMail Corp. and Wynd Communications Corp. for gateway access to a network from RAM Mobile Data USA LP, located in Woodbridge, N.J. Randy Dence, Megaherz's wireless product line manager, notes that this system can send information via e-mail, fax or page. Moreover, the store-and-forward nature of the network means that a message won't be lost if transmission is interrupted when a subscriber leaves the network's coverage areas or drives through a tunnel. Other wide area systems of this type include Ardis Co.'s Ardis service and the Cellular Digital Packet Data service from Bell Atlantic Mobile Systems Inc.

Vendors of handheld devices have also teamed with wide area wireless services, relational database firms and makers of "middleware" products to provide systems that allow access to corporate client/server databases.

The middleware component consists of server software that manages the communications link between an information repository and a handheld client. Middleware vendors include Racotek Inc. and MobileWare Corp., which recently formed an alliance with Informix Software Inc. Informix will include MobileWare software in its programming and application environments.

As the increased power and flexibility of handheld devices make them more attractive business solutions, consumers are apt to be dazzled by nifty new options and gadgetry. But as Janet Boudris, senior vice president for strategic marketing at RAM Mobile Data, points out, the only features that should prompt a sale are those that meet a customer's specific business need—whether it's preparing a spreadsheet, inputting sales orders or collecting urgent messages. "The key is to carry the device you need to do the work you have to do," Boudris says.

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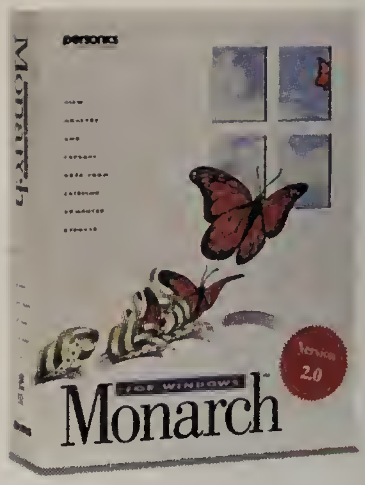

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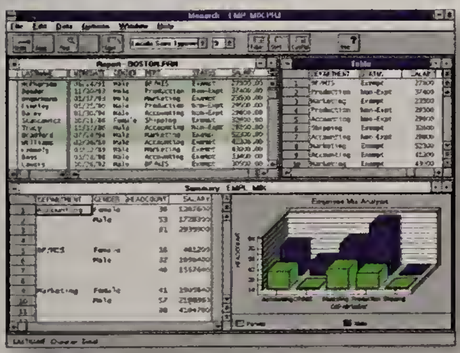

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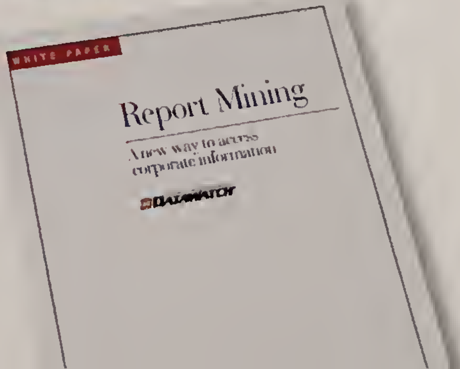

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